creative computing

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In-Depth Evaluations:

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- HP 110 Notebook Computer
- Macintosh
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- Roland Plotters
- Apple Mouse
- Turbo Pascal
- The Print Shop
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"Borland's Turbo Pascal is a giant step in the right direction."
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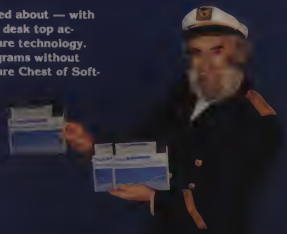

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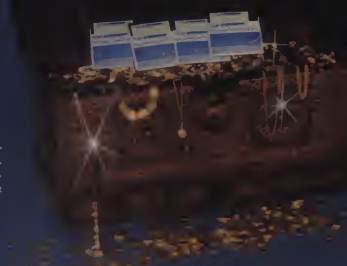

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micro fun

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CIRCLE 145 ON READER SERVICE CARD

Input/Output

Adam: Yea

Dear Editor:

As the owner of a ColecoVision Adam Expansion Module, I wanted to thank you for your extensive, objective review of the Coleco Adam. What a refreshing relief from the poorly researched, headline-mongering drivel I've read elsewhere!

I also wanted to extend a suggestion to Mr. John Butler of Virginia Beach, the man whose Adam seemed to be "blowing up" letters: try another Digital Data Pack tape—or another track on the same tape.

I encountered what I think is the same problem: strange hieroglyphic characters when I tried to go back over the second page of text. Yet this happened on only one track of the Data Pack. I therefore assumed the problem was in the tape itself and kept a "dummy file" open on the track where the malfunction occurred. The problem has never recurred on any other track.

Also, I'd like to agree: Coleco service is extremely fast and courteous. When I discovered three or four minor glitches in the word processing program, Coleco's service agent, Honeywell, installed a revised CPU overnight under warranty, and the Adam has been working perfectly ever since.

Finally, the reviewer, Stephen Gray, made one error of some significance in an otherwise flawless critique: he says one should "turn Adam off, put the SmartBasic tape into the drive, turn Adam back on." Wrong! One should insert or remove a Data Pack only when Adam is on and the tape has stopped moving. Turning Adam on while the tape is already in the transport may erase the files.

Jerry P. Danzig
105 E. 24th St.
New York, N.Y. 10010

Adam: Nay

Dear Editor:

Regarding "Coleco's Adam" (April, 1984), are you kidding? You clearly state that this computer is "good for beginners." Do you really think a computer with a 50% return rate is a good place to start?

The tape drive is extremely unreliable. The printer rarely works. The software is full of bugs and devoid of documentation, and local service is non-existent. Many of my friends have given up on home computers with far less reason than this.

If your readers have $750 to spend on a home computer, word processor, and game machine, may I make the following suggestion? Buy this:

Atari 800XL 64K Home Computer	$299
Atari 1027 Letter Quality Printer	$299
Atari 1010 2-channel Cassette Recorder	$74
Atariwriter Word Processor Cartridge	$79
	$751

Perhaps you know something you are not telling us, but I can see no advantage to buying a Coleco Adam over an Atari or Commodore computer.

George F. Rice
122 Autumn Dr.
Vicksburg, MS 39180

Adam: Hey

Dear Editor:

I am writing to inform you of an error that appeared in the article entitled "Coleco's Adam" (April 1984). The author states that, like Apple Basic, Smart Basic looks at each line for errors as it is entered. Apple Basic does not check each line for errors as it is entered. There is also a problem that I hope you might be able to help me solve. I am having problems sending, from a Basic program, the control codes that set the tab stops on the Apple Imagewriter printer. If you or any of your readers could help me in this, I would be much obliged.

John Engstrom
4008 Fawnhollow
Dallas, TX 75234

Cleaner Clarification

Dear Editor:

The article in your December issue on disk head cleaning kits was worthwhile reading, but I would like to point out three things:

1. The Nortronics kit does not get 32 cleanings per disk; it gets only four (one for each logical track). This raises the calculated cost per cleaning from $.13 to $1.02, or just about average.

2. The big feature of the Nortronics kit, the use of a different area of the cleaning disk each cycle, is obviated (at least on the TRS Models I and III) by a slight bug in the supplied program which outputs the logical track (1-4) to the drive instead of the physical one (4, 13, 22, or 31). Physical tracks 1-4 are so close together as to be essentially the same spot. The simple fix is:

3000 POKE 14319,B for the Model I
and
3000 OUT 241,B for the Model III

3. Users of any kit who have single-sided drives get a bargain: they can flip the cleaning disk over and use the other side. I suggest marking the hub area of the used side in some way to avoid confusion.

Bob Blumenfeld
8824 West 34th St.
St. Louis Park, MN 55426

Notices

Game Camp

A one-week course on programming your computer to play chess, blackjack, checkers, bridge, and othello will be given by computer game experts Monty Newborn and David Levy at the Salzburg Inn in Stowe, Vermont. The course will be held twice: August 13-17, 1984 and August 20-24, 1984. The cost is $550 a week.

The course is intended for people who can program in Basic, Fortran, or Pascal. Attendees are encouraged to bring their own computers, but it is not necessary for enrollment. As a renowned resort area, Stowe features a variety of summer sports, entertainment, and excellent restaurants. For information call (514) 481-1766.

Bibliography

More than 300 new books are listed in the 17th edition of the *Annual Bibliography of Computer-Oriented Books*, recently released by the University of Colorado.

All introductory-type books published prior to 1980 were deleted. Despite the deletions, the bibliography still contains more than 1200 books from 173 publishers. The bibliography separates the books into 86 categories and catalogs them according to type (reference, textbook, handbook) and style of presentation (programmed instruction, case study or narrative).

Copies of the bibliography are available for $4 from Computing Newsletter, Box 7345, Colorado Springs, CO 80933. The cost is $6 if an invoice is required.

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CIRCLE 179 ON READER SERVICE CARD

Creative Computing Benchmark

The Creative Computing benchmark is a short test of computational speed and accuracy and the random number generator in Basic.

Computers are listed in order of completion time of the test in minutes and seconds. In the accuracy measure, the smaller the number, the better (.00000001 is good while .187805 is poor).

We have taken note of the criticisms of this simple test and have devised a new test which is considerably more valid and comprehensive. Watch for it in the early fall.—DHA

```
10 ' Ahl's Simple Benchmark
20 FOR N=1 TO 100: A=N
30 FOR I=1 TO 10
40 A=SQR(A): R=R+RND(1)
50 NEXT I
60 FOR I=1 TO 10
70 A=A^2: R=R+RND(1)
80 NEXT I
90 S=S+A: NEXT N
100 PRINT ABS(1010-S/5)
110 PRINT ABS(1000-R)
```

Computer	Time	Accuracy	Random
Sorcy	0:05.01	.000000814	4.1
Amstrad 6128	0:05.94	.000238881946	13.4
Harris H-1000	0:06.06	.000031819931975	7.9
IBM 370/67	0:06.80	.000000000145835	4.6
Control Data Cyber 835	0:06.89	.000000035478]	6.1
Control Data 6400	0:06.14	.000000035478]	6.1
Harris H-800	0:06.14	.000064181942946	6.8
HEC System 10	0:06.16	.00044105	0.5
DMD VAX 11/780	0:08.28	.08113525	5.3
DEC 11/70 RSTS I w/FPP	0:08.31	.000000001402796	9.9
UNIVAC 1108 (Nubal)	0:06.34	.000000000158025	6.8
Burroughs B6810	0:08.82	.000000005638	11.5
QTI 2400, Rev. 4.2	0:08.41	.000000000233	9.9
UNIVAC 1100/1700 (double)	0:08.5	.000000015283	5.5
DEC PDP 11/44	0:08.0	.000000001468298	2.4
DEC PDP-11/70 (RSTS)	0:08.0	.000000001468298	15.8
IBM PC (Basica?)	0:02	.000000000088462	47.1
Prime 550	0:02	.000000078376	12.2
HP 9845B (190 bit slice)	0:03	.00000002	23.1
Control Data Cyber 730	0:03	.000000035478]	6.1
HP 3000/44, single pre.	0:04	.112549	6.0
HP 3000/44, double pre.	0:05	.000000000273299	9.4
HP 9836	0:05	.000000001273229	5.5
DTI 5000	0:05	.09741189151	10.3
Control Data 3500	0:05	.001302457	2.0
Wang 2200 B/C	0:07	.00000076	3.9
Alpha Micro AM 1000	0:05	.000000926911	12.4
IBM PC (Compiled Basic)	0:06	.01159644	20.4
DEC PDP 11/44 (RSTS)	0:07	.000000001560251	11.5
Wang 2200, Model T	0:07	.000000000080105	4.6
WANG VS	0:07	.005059375	7.2
Tandy Model 2000	0:07	.005059375	7.2
Data General Eclipse	0:08	.000000000345035	1.2
Eagle 1688	0:08	.005059375	7.2
Sharkra Micro	0:08	.005059375	7.2
Burroughs B20	0:08	.000000000344497	2.2
Symbolics 3600	0:09	.0000320125	8.5
DEC PDP 11/24	0:09	.000000001482898	19.9
Alpha Micro AM 1000T	0:08	.000000926911	12.4
DEC Professional 350	0:11	.000000000082967	15.8
HP 9825	0:11	.00000002	9.1
WorthBar B/16	0:11	.005059	7.2
Burroughs B22	0:12	.005059375	15.3
HEC Adv Perm Comp	0:12	.005059375	7.2
Tektronix 4054	0:12	.000000001482598	0.5
Olivetti M20	0:13	.01141376	6.2
Apple w/Sayprook 68000	0:13	.000000000111	10.4
Leading Edge PC	0:13	.005059375	7.1
TI Professional	0:13	.005059375	7.1
Compaq	0:15	.005059375	7.1
HP 150	0:15	.005059375	7.1
HP 9845B	0:15	.00000002	23.1
Zenith Z-100 (8088)	0:17	.005059375	9.7
Samurai 816	0:17	.01159668	5.3
ACT Apricot	0:18	.005059375	7.2
Canon AE-10F	0:18	.005059375	7.2
Corona PRO	0:18	.005059375	7.2
Sharp PC-5000	0:18	.005059375	7.2
IBM 3A (short precision)	0:10	.1967	25.2
Eagle PC-2	0:19	.005059375	7.2
Apple w/Wasper#	0:19	.001159264	8.0
Victor 9000	0:20	.005059375	7.2
DEC Rainbow 100	0:20	.005059375	7.2
Acorn BBC Computer	0:21	.000012076033	7.2
Columbia MPC	0:21	.005059375	7.2
Computer Devices DOT	0:22	.005059375	7.1
Compucorp 77	0:22	.005059375	7.1
Apple][w/ALF 8088	0:24	.00807558	10.4
IBM PC	0:24	.01159668	6.3
LRI CADA	0:24	.000201107895551	8.6
Monroe EC5600 (single)	0:27	.2475599	10.6
Gimix 6809, TSC Ext Bas	0:29	.000000007041407	6.2
DCE Vectrex	0:33	.8753176	6.9
Apple II, Titan Accel	0:33	.001141435	4.5
Sharp MZ-80A	0:35	.0002217292	0.6
TI DS990/12 (mini 7E)	0:36	.000000300	3.1
Apple II+ 6502, C?P	0:40	.04	4.0
Laser 2400	0:40	.0003272295	17.4
CompuPro (8085)	0:40	.187805	7.4
Monroe EC9600 (double)	0:42	.000000000068202	10.8
Epson QX-10	0:42	.00000002	7.5
Heathkit HX-512	0:46	.000323962112	6.9
Osiloc Atom	0:47	.000042929419	6.9
HP 9826C	0:47	.000000001273229	23.2
Grid Compass	0:48	.000000000080868	2.1
Lobo Max-80	0:48	.01130745	6.0
Lynx	0:51	.155	6.1
TRS-80 Model 4	0:53	.0610776	16.1
Panasonic JS200	0:53	.0002140114	15.3
DCS 1000	0:59	.187805	7.4
IMS 8088	0:59	.187805	9.6
Alpha AC/-1	0:59	.187805	7.4
OECheate 12	0:59	.187805	7.4
Xerox 820-1	0:59	.187805	7.4
Midwest Sci 4mHz (SOS3)	0:59	.8140427	8.6
Morrow Micro Decision	1:00	.187805	7.4
Exxon 1000	1:00	.187805	7.4
Access Matrix [Astrix]	1:00	.1875005	7.4

Computer	Time	Accuracy	Random
North Star Horizon (Z)	1:00	.187805	7.4
IBM 5A (Long precision)	1:05	.000000001347	19.7
Cromemco Dazzler (Z-80)	1:05	.0078745	7.4
Apple II+ Ramcard (Z-80)	1:06	.187805	7.4
HP Vectra	1:06	.187805	7.4
Toshiba T100	1:06	.187805	7.4
Epson QX-10, MBasic	1:07	.187805	7.4
Osborne	1:07	.187805	7.4
TRS-80 Model 2	1:07	.187805	7.4
NorthStar Zorba 280	1:07	.187805	7.4
Nec Multivision 8085	1:08	.187805	7.4
Sharp MZ-731 w/FDOS	1:09	.00001403	4.1
Mattel Aquarius	1:10	.187805	10.8
Wang 2200 (Basic-80)	1:11	.0578776	7.4
Epson QX-10	1:12	.187805	7.4
Cromemco 4PS Typewriter	1:13	.187805	7.4
HP-85A	1:14	.00000002	14.3
TRS-80 Color Computer	1:15	.32959	5.5
Xerox 820-II	1:15	.00001]	3.4
Lanier/ASI 1100	1:15	.187805	7.4
HP-86A, B	1:16	.00000002	14.3
Tektronix 4051	1:16	.000000014042596	6.1
Digital Group Systemaster	1:17	.00001]	3.6
NEC PC-8081A	1:19	.0330745	1.8
Coyo Chubi DU	1:19	.00002779	1.5
Sanyo MBC 550, 555	1:20	.0626481	1.6
Atari 400, 1200 (MBasic)	1:20	.150878	0.1
ITT CSP-DF	1:21	.001141435	10.6
Heath H-88	1:22	.00561521	2.7
Apple Macintosh (dbl)	1:36	.000000458	4.2
Keypro II	1:36	.187805	7.5
Sony SMC-70	1:38	.000000458	3.8
HP-75C	1:38	.00000002	5.8
North Star Horizon(Z dsq)	1:43	.008473	3.6
NEC PC-8201	1:44	.187805	9.3
Exidy Sorcerer	1:47	.0330745	13.2
Microdigital MicroBrunner	1:48	.150878	7.4
Teleram 3800	1:48	.187805	7.4
Apple II	1:48	.0019131	6.7
Sharp MZ-80K	1:49	.001141435	23.2
Commodore SuperPET	1:50	.000289733612	26.4
HP 9836B	1:52	.00000800	13.1
Sanyo MBC-1000	1:52	.001141435	6.9
Apple IIe, IIc	1:53	.001141435	10.6
Franklin Ace 1000, 1200	1:53	.001141435	12.0
NEC PC-8801A	1:54	.187805	7.4
Microsoft Alm 65	1:56	.001141435	14.7
Compucolor II	1:57	.0330745	1.4
TRS-80 Model III	1:59	.0330745	5.8
Micro Color Computer	1:59	.000596201467	7.6
Commodore CBM 8032, 2001	2:01	.001141435	1.4
HP-71B	2:03	.00000802	5.8
Heath/Zenith H-89A	2:04	.187805	7.4
Atari 1400 Graduate	2:15	.000224679780	7.9
Atari 800	2:15	.0126746	12.6
Tiger/Sinclair 1P80 (fast)	2:19	.000596204467	7.3
Interact Model B	2:20	.0330745	7.4
Epson HX-20	2:36	.000596204467	7.3
DAI	2:36	.0126746	12.6
Timex/Sinclair 1P80 (fast)	2:43	.000612948898	9.6
Interact Model F	2:50	.0330745	7.4
Wang 2210	2:52	.000011432	12.5
OSI Challenger I	3:07	.001141435	13.9
Lanier ASI Superplus	3:30	.187805	7.4
Spectravideo 328/328	3:48	.000000285B	8.7
TI 99/4A	3:46	.00000011	2.6
Radio Shack PC-3	4:00	.000000027	10.7
TI 99/4A, Extended	4:38	.00000011	10.7
Unic-1	4:40	.001141435	12.0
Datapoint 1800	4:16	.000001204?	11.3
Sinclair 1K01	4:23	.000045522	6.1
Sinclair Spectrum	4:39	.000045257	3.5
TRS-80 Model 100	4:54	.000002858	5.9
Timex 2068	4:55	.000668764[1]	12.0
Tomie FP-200	5:05	.00723	13.0
Sharp PC-1500 (as PC-2)	5:10	.0008298	7.0
Commodore C-10	5:10	.00000001	6.1
TI CC-40	5:41	.00000011	6.2
Sord/Sony PRC-25	5:41	.000215785446	8.2
Franklin 1200 (Classic)	5:47	.000000000746	14.3
Canon X-07	5:03	.000000858	24.9
Atari 1200XL	6:45	.013959	5.2
Atari 400/800	6:48	.012959	12.6
Casio FX-702P	9:15	.000034	2.8
Sharp FX-502P	9:15	.00000627	2.5
Sharp EL-5500	9:55	.00002]n	1.2
Sharp PC-1250	9:59	.0009258	5.9
Vegas	11:45	.000000000744	---
Midwest Sci 4MHz	14:00	.1597	12.5
Timex/Sinclair 1000(slow)	16:55	.000612948898	7.4
IBM System 23	18:40	.000000055]	7.4
HP-97	23:40	.000037	---
Sharp PC-1211	24:00	.00002882	---
HP 11C	24:00	.00000	8.0
Central Data 2650	32:31	.003526	4.6
TI 58C-59 (Calculator)	12.7 days	.193784289	16.4

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"Excuse Me,

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An advanced, easy-to-use data management system for the IBM® PC and compatibles.

Want to get your paperwork out of a clumsy file cabinet and onto your PC's screen, where you can manage it better? Frustrated with data base software that's either too limited or too difficult to use? Hayes offers you a simple word of kindness.

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"The menu, Please?"

Menus list all your options and tell you exactly which keys to press for every *Please* feature.

That's to be expected. As the telecomputing leader, Hayes built its reputation on quality design, reliability and customer support. Now these same standards have been applied to a new data management system that is going to instantly change the way you do business!

Say you're looking for an efficient way to maintain sales data. *Please* leads you every step of the way in creating a sales database that might include names, addresses, dates and figures. These categories are called "fields" in database lingo, and they're the very heart of your database structure.

Want last month's total in a particular region? Press a few keys and it's yours! A few more keystrokes and you'll know who's moving product, and what's your biggest seller.

Please will supply you with labels for a mailing to selected customers. It can send customer information to your word processor for a promotional letter. And it can receive data from your spreadsheet program. *Please* will even look up a name and company for you, your Hayes Smartmodem* will dial the phone number, and you're ready to talk!

Taking this same sales database, you might also want to define special fields for a custom Output Plan. With a defined field for "COMMISSIONS DUE," *Please* can automatically compute each salesman's commissions, and print them out in a report of your own design. All this and more, just for saying "Please."

"Make it snappy, Please!"

Need a report fast? You and *Please* can put together a Quick List in a matter of seconds.

And if you ever change your mind and want to change the structure of your database, please feel free. Step-by-step instructions show you how.

You have the same flexibility with any database you and *Please* design. You can store up to 16 million records and 200 custom Output Plans for each database! More than you're likely ever to require. But isn't it nice

Please is a trademark of Hayes Microcomputer Products Inc. * Smartmodem 300 is a registered trademark of Hayes Microcomputer Products Inc.

Please."

"Put it here, Please."
Design a special screen format to position data in a particular place.

Just in case you ever need it?

Now you might think that a data management system that does all this must be difficult to use. Right? Rest assured. *Please* works hard so you don't have to. An easy-to-follow sample disk shows you everything you need to know to create your first data base. Three *Please* menus show you which keys to press to access every feature. And whenever you need it, *Please* provides on-screen HELP messages, tailored to a specific task. So you needn't waste time reading through a list of unrelated instructions on your screen. Or stop what you're doing to consult a manual. In no time at all, and with no assistance at all, you'll be a *Please* database pro!

knowing all that storage power is there?

Everything about *Please* is designed to save you time and effort. So what could make data management even easier? *Please Application Templates*, that's what!

To help you get up-and-running immediately, we've developed a series of practical, pre-designed templates. You'll appreciate their well-thought-out structure, and "fill-in-the-blank" ease. Choose several! For business and personal use. Including *Mailing List*, for storing names and addresses and producing mailing lists. *Contacts*, for managing facts and figures about your sales contacts. *Applicants*, for following applicants throughout the interviewing process. *Appointments*, for maintaining your calendar and tracking all of your business expenses. *Household Records*, a complete home management system. And more! Your dealer has details!

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Apple Macintosh

Cutting Through The Ballyhoo

The first step to knowledge is to know that we are ignorant. —Socrates

Why, a four-year-old child could understand this. Someone get me a four-year-old child. —Groucho Marx

HARDWARE EVALUATION

John J. Anderson

The shorn, brainwashed drones sit motionless in row after benumbed row. In tight close-up on the oppressive viewscreen, an awful, sneering face spouts empty Newspeak slogans while computerized rhetoric scrolls by left and right.

The hall is blue and motionless. Suddenly, an athletic blonde woman appears, running down an aisle towards the apparition of Big Brother. In her hands there is grasped a heavy sledge of the type that is used in Olympic competition. She stops and sets. Obviously practiced in the hammer throw, she swings the tool away. We watch it fly in slow motion—we watch it shatter the viewscreen to bits in a flash of light. We see for the first time a glimmer of feeling cross the faces of the multitudes. Their mouths simultaneously gape into slackjawed amazement.

Fade to white. And the words "On January 24th, Apple Computer will introduce Macintosh. And you'll see why 1984 won't be like *1984*."

Orwell that Ends Well

Hype, certainly. And just the tip of a multimillion dollar ad campaign iceberg that included lavish 12-page four-color inserts in *Time* and other major noncomputer magazines. The launch of Apple Macintosh was quite a media event.

And yet something about the commercial seems more than mere hype—seems to have hit home somehow. Directed by Ridley Scott (director of the modern cult classic *Blade Runner*), the 60-second spot touched a nerve across the nation, even though you could count the total airings of the spot on the fingers of one hand. Something about it—its mood, its tone, its timeliness, its youth, its feeling of liberation, its likeness to music video—captured the public imagination.

And perhaps the commercial touched a nerve with more than a few computer users—those who feel frustrated, shackled by current software restrictions. Perhaps it excited a few potential buyers—those who have wanted a micro but felt oppressed by the complexity of existing systems. Personally, I identified closely with the drones, and not just because they were mouth-breathers. If I found that something *truly better* was available I would hurl that hammer myself.

Mac Under the Microscope

But you must be careful about buying promises, and that is exactly what the *1984* commercial attempted to sell. In its current form, the Macintosh is the distilled embodiment of a promise: that software can be intuitively easy to use, while remaining just as powerful as anything else around.

That's a tall promise.

By this time you have undoubtedly already read and/or heard about the Macintosh machine. And what you have heard is very likely to have been praise, though you may not be so clear on if or why such praise is merited. The honeymoon phase is still in progress, you see, and most reviewers, it seems, are so moved, so awestricken, so swept away by the excellent features of the Mac, they are willing to gloss over the not-so-excellent.

And there are more than a few of those.

Don't be misled, however. You will not be reading a pan of the Apple Macintosh in the pages of *Creative Computing*. We are quite impressed with the machine.

emphatically enthusiastic about its philosophical underpinnings, very hopeful for its future. We just feel it is about time the hard questions were asked, and answered alongside the starry-eyed hoopla. It is time for a good hard look at Macintosh under a piercing and objective light.

Objective Light on the Subject

Whether or not the Macintosh is actually a breakthrough, it surely *looks* like one. It doesn't look like much of anything that has come before (with the possible exception of the moribund Vectrex videogame unit, which, if painted beige, would bear a startling resemblance).

The Macintosh is small. With a recessed handle in the top of the main unit and a total weight, complete with internal CRT, of 22 lbs., the Mac qualifies as a bona fide *transportable*, meaning you can move it around relatively easily when the time comes. Drop it into its custom-made rucksack (a $100 option), and take off.

Sit it on your desk, and you will quickly notice how little room it takes up. Its footprint is barely larger than a sheaf of papers. And though the unit is rather bizarre-looking at first glance, it is also rather handsome. Its looks grow on you.

The Keyboard

Attached by a modular phone cable to the main unit is the detached Macintosh keyboard. This is a 58-key, full-stroke Selectric-style layout (see Figure 1), with a somewhat stiff but very professional feel.

Based on my experience with the Mac, I think it is unlikely that you will ever be pulling the keyboard onto your lap. Still, the detached design is desirable. It makes comfortable positioning of the keyboard entirely independent of comfortable positioning of the screen, and that is extremely important. At the same time, the keyboard can be pushed away in an instant, so that you may reclaim precious desk space when access to the keyboard is not immediately necessary.

Noticeably lacking on the Macintosh keyboard are special function keys and directional cursor movement keys. These are replaced by the mouse pointer peripheral from which the Mac receives all directional inputs. I am told that cursor movement keys appear on the add-on numeric keypad (a $130 option), but these are not read interchangeably with mouse movement. We shall be examining this question more closely up ahead. As for special function keys, the idea is that the mouse renders them unnecessary. I'm all for that.

Figure 1. Detachable keyboard allows comfortable positioning.

The Mouse

Then there is the mouse itself. Though it is a tiny thing, better clear at least a square foot or so of desk space for moving it around. The more room you make for it, the easier control of the mouse becomes.

As you move the mouse, an on-screen cursor mimics your moves. At first, controlling the screen cursor with the mouse is anything but intuitive. The mouse seems cumbersome, and hard to control for detailed work. (Unlike the Summa Graphics mouse, by the way, tracing is out of the question.) With a few days of practice, however, working the cursor with the mouse becomes second nature. (Once you learn to lift the mouse when you run out of desk space and reposition it so that you have the room you need, you have learned the major secret of effective mousing.)

The mouse has a mechanical device with a rolling ball inside it, as opposed to optical or pull tracking, to measure relative movement. Therefore your desk area must be free of dust and particulate matter (such as Ritz cracker crumbs) for the mouse to work reliably. The documentation actually tells you how to remove the ball for an occasional cleaning.

The Mac mouse has a single button on its top. Hence there are no inhibitions

SYSTEM PROFILE

CPU: 68000 32-bit Motorola microprocessor

Memory: 128K RAM, 64K ROM

Display: 9" diagonal b/w bit mapped monitor 512 x 342 pixel graphics resolution

Keyboard: Detachable 58-key fullstroke keyboard

Disk Drives: One single-sided 3 1/2" microfloppy drive (400K storage)

Sound: Four-channel sound/music capability

I/O Ports: RS-232/RS-422 connector

Other: Mouse controller, clock/calendar (battery backup), modem/AppleBus connector, second disk drive connector (may also be used with a hard disk when available)

System Software: System software supplied in ROM includes Group Code Recording disk operating system and QuickDraw graphics package.

Desktop Accessories: Calculator, Clock, Puzzle, Control panel, Scrapbook, Notepad, and Key caps. Additional desktop software includes Wastebasket, Get Info, Disk Copy, and Clipboard.

Instructional: Guided Tour learning system disk with audio cassette. MacWrite and MacPaint included free for a limited time.

Dimensions: 13" x 10 1/2" x 9 3/4" 22 pounds

Summary: Without a doubt, a hardware and software breakthrough.

Price: $2495 for Macintosh $2990 for Macintosh and Imagewriter Printer

Manufacturer:
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

concerning which button to press when the time comes to press a button. It is

Macintosh mouse: point and click.

impossible to make the wrong choice. When designing a mouse for ease of use, a single button helps considerably.

Double-clicking the single mouse button frequently also acts as a short-cut mechanism, to obtain certain other functions.

The System Unit

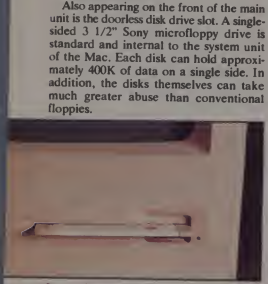
The major business goes on inside the main unit of the Macintosh, so let's get a closer look at it.

Your first concern about the system component is bound to concern the CRT display. Is a 9" diagonal screen truly big enough to allow extended viewing without fatigue or strain?

The answer in this case is yes, and the reason is the super-high screen resolution of 512 x 342 monochrome pixels. Add to this the fact that nearly all text reads out in black type on a white background, emulating an actual printed page, and you have an exceptionally legible display. Not once have I found myself lamenting the diminutive screen size. Indeed, after a few minutes on the Mac, you will dismiss that question for good.

The Microdrive

Also appearing on the front of the main unit is the doorless disk drive slot. A single-sided 3 1/2" Sony microfloppy drive is standard and internal to the system unit of the Mac. Each disk can hold approximately 400K of data on a single side. In addition, the disks themselves can take much greater abuse than conventional floppies.



Internal disk drive slot.

Each disk has a spring-actuated sliding aluminum cover on it, which the Macintosh opens automatically when the disk is inserted, and shuts automatically upon ejection. Thus the head slot is protected at all times. The disk case is rigid, and as you may have heard before, "slips into a shirt pocket."

Apple uses a proprietary technology to get 400K onto a side: nearly 100K more than the conventional Sony format. More importantly, this effectively eliminates the possibility of third-party Macintosh "work-alikes." This is a good indication of the savvy that went into the design of the Macintosh.

At times, when a disk is spinning in the drive, it sounds jarringly like a cheap friction toy. This is because the Macintosh drive utilizes a variable RPM speed. The result is the ability to write more data to the outer disk tracks. Drive rotation speed varies from 390 to 600 RPM, depending on the track.

No read/write light is necessary on the Mac drive; when a disk is in the drive you

Figure 2. Rear of system unit.

cannot remove it without undertaking rather drastic measures. Nor is there a disk eject latch or button. Disk ejection is controlled entirely through software, as we shall discover ahead.

If, as a result of some emergency, you *must* manually eject a disk from the drive, you can effect this by pressing the point of an unbent paper clip into a small hole beneath the drive slot.

The only other features of the system unit front side are the brightness knob and the keyboard input jack. The brightness knob is the only CRT control externally available on the Mac, and the only one necessary. The keyboard input consists of a modular telephone jack.

Now let's flip the Mac system unit around for a look at its rear panel.

Here we see the power switch and six connector jacks (Figure 2). These connect to AC power, the mouse, printer, optional second disk drive, optional modem or AppleBus network line, and optional external sound amplifier. You will also notice the Macintosh nameplate back here on the *rear* of the computer. Why? My guess is to keep the front of the machine as nondistractive as possible. The Apple Logo appears up front and constitutes identification enough.

Some things you *won't* find on the rear panel of the Mac are an expansion bus, parallel port, or video output jack. We shall return to the issue of these omissions. Standard DB-25 RS-232 serial connection is available, however, using the printer port.

The top right side of the back panel sports a battery compartment. The special 4.5 volt alkaline battery maintains the built-in clock/calendar, as well as serving to keep user-selectable settings in memory between power-ups. The documentation estimates a battery life of approximately two years.

Inside the main unit is an unimposing 9" x 9" circuit board with a 32-bit 68000 central processor chip residing upon it. The CPU runs at 7.83 MHz, which is fast indeed (see (Figure 3) for the benchmark test results). The Mac sports 128K of RAM and 64K of ROM. Six special chips are most responsible for compactness of the motherboard. Each in itself is the equivalent of an actual circuit board.

A major benefit of Apple's advanced motherboard design is not only compactness, but the fact that the system does not require a cooling fan. If there is one thing that drives me to distraction on certain micros which shall remain nameless, it is the constant hum of their cooling fans. Computers can, and should, run in total silence.

Except when we *want* them to make

Internal battery powers clock/calendar.

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CIRCLE 157 ON READER SERVICE CARD

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Suggested retail price $395
Graphics Libraries individually priced $80-$90

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The Imagewriter makes full use of the Macintosh graphic capabilities.

noise, of course. The Macintosh has four-channel multi-octave sound synthesis capability. This capability can create beautiful music and can certainly be translated into state-of-the-art speech synthesis as well. Macs are bound to become the most talkative microcomputers around before too long.

The Imagewriter

Though in theory you can drive any RS-232 serial printer with a Macintosh, I can't imagine why you would want to do so. The only printer that fully supports all Mac's potential is the Apple Imagewriter. This printer was introduced last year as an accessory for the Lisa and the IIe, but was designed solely to serve as the *de facto* Macintosh printer. In this case again, Apple has insured exclusivity (at least for a time) in its design of the Macintosh printer interface. Until third-party manufacturers decide to create their own Mac-compatible printers, Apple has the market sewn up.

The Imagewriter is a serial interface, impact dot-matrix machine, capable of a top speed of 120 cps. Its vertical dot spacing is 1/72" minimum, which is very tight. Line spacing is selectable in increments of an incredible 1/144" minimum. The result is crisp and fully-formed looking characters and graphics.

Paper width can run from 3" to 10", and is acceptable in single sheets, roll, or fanfold pinfeed formats. The printer is easy to load, and a special cut sheet slot aids friction-feed applications.

During operation the Imagewriter is relatively noisy, but the machine is totally silent in the standby mode. The ribbon cartridge is quick and simple to change.

Conveniently, paper feed is bidirectional—forward or reverse, without the threat of jamming. The control buttons are well placed and designed for ease of use. You can execute a form feed, for example, then reselect for on-line operation *before* the form feed has completed. When the paper stops, the select light will come on, indicating the printer is back on-line. This kind of attention to detail makes working with the Imagewriter a pleasure.

The unit has three print modes: draft, standard, and quality. Naturally, draft is the fastest, and most closely approximates the output of the average dot-matrix printer. On the Mac, the standard mode reproduces text and graphics just as they appear on the hi-res screen. In the quality mode, a second pass is made for every pass of the standard mode. This makes the resulting copy darker and, more important, fills in the dots of the matrix for a fully-formed look.

A la carte, the Imagewriter lists for $695, which is a good price considering its quality and features. However, bundled with the Mac, the unit goes for $200 less. I am quite sure that most Macs are ordered *with* Imagewriter. To do otherwise at the price would be sheer folly.

Documentation

Macintosh documentation is uniformly superlative. It is colorful, thorough, lively, and fun to read throughout. IBM could take a lesson from Apple on this account. Included with the documentation is a training disk and audio cassette. The cassette is from Windham Hill Records and includes some very mellow jazz piano. Like the Mac itself, the Mac documentation exudes simplicity and class.

As we shall now discover, the Macintosh is very easy to use, just as the documentation is easy to read. The entire goal was to create a system that is powerful, yet utterly painless to use.

Toward a Philosophy of Software

Though the story of the Mac is undeniably a story of hardware breakthroughs, it is just as much a history of solid software effort. The Macintosh is the first piece of consumer hardware to display a defined software philosophy. Before we can truly understand the Mac, we must make a swift digression to grasp that philosophy and trace the software history of the Mac.

Indeed, the hardware technology necessary to bring you the Macintosh is quite fresh. But the basic concepts underlying Mac software are more than ten years

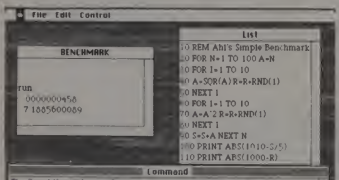
File Edit Control
BENCHMARK
List
10 REM Abi's Simple Benchmark
20 FOR N=1 TO 100 A=N
30 FOR I=1 TO 10
40 A=SQR(A)*R*RND(1)
50 NEXT I
60 FOR I=1 TO 10
70 A=A^2*R*RND(1)
80 NEXT I
90 S=S+A NEXT N
100 PRINT ABS(1010-S/5)
110 PRINT ABS(1000*R)
run
.0000000458
7.1885600089
Command
The David H. Ahl Quickie Benchmark was run in Microsoft Basic on the Macintosh. It returned an accuracy of 0.0000000458, which is better than many mainframes tested. Its sum random was 7.2, which is excellent. However it was quite slow - the answer took 1 minute 36 seconds to come in. For the Mac's exact standing, check the Benchmark page up front.

Figure 3. Benchmark program and results.

File Edit Goodies Font FontSize Style
Plain ^P
Bold ^B
Italic ^I
Underline ^U
Outline ^O
Shadow ^S
Align Left ^L
Align Middle ^M
Align Right ^R
MacPaint gives you full text capabilities alongside unmatched graphics features
All of it is easily accessible to the novice
and is available at the click of the mouse.

Figure 4. Pull-down menu overlaps Macintosh logo.

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old. It has taken until 1984 to realize them in a relatively low-cost machine.

Yet the imagery used in the Macintosh *1984* commercial is quite apt. In the category of software, the Mac is truly an innovator and may actually get its chance to bring down the well entrenched big blue guard. The system software, as well as the two existing pieces of truly finished applications software currently available for the Macintosh, MacPaint and MacWrite, are the direct result of five years of Apple research and development with the Lisa machine and its software. And that research was based on an earlier five years of effort begun and built upon at Xerox PARC (Palo Alto Research Center).

As a result, even the most severe critic might agree that Macintosh software sets new precedents for ease of use. Harnessing the power of formidable bit-mapped graphics resolution, along with mouse pointer technology, the user is guided through available functions using three main methods: the icon, the window, and the pull-down menu (Figure 4). All rely on the mouse pointer peripheral, rather than the keyboard, for input.

Icons are pictures that represent ideas. On the Mac, a disk is depicted as a small picture of a disk. Deletions move into a small garbage can. Word processing documents appear as tiny typewritten pages. Graphics documents appear with tiny paintbrushes on them. Systems programs take the form of mini-Macs.

Now if we assume that a computer user knows how to read, which may or may not be a safe assumption, why use icons when you could just as well spell things out? Well for one thing, there is an immediate spatial recognition of icons, and as lexical cues are used alongside them, the icons act to help the system work more "intuitively."

Want to "throw something away?" Use the mouse to pick it up and put it in the garbage can—it's that simple. Point, click, reposition, click. And until you "put the garbage out," you can go back into the can and retrieve anything you have put there.

Windows are just that: they are movable, re-sizable viewports into documents, applications, and functions. Multiple windows can be opened and closed, stacked on the screen, then selected with the mouse. They can be tailored to sit side by side or one on top of another. You may choose to keep your desk as clear or as cluttered as you want it to be.

The idea here again is to make things work more intuitively. The more the computer can appear as an actual "electronic desk top," the easier it will be to use. Windows allow you to "shuffle papers" just as you would on an actual desk. In fact, there is probably a correlation between the messiness of a user's real life desk top and his Macintosh desk top.

Pull-down menus make choosing command functions as simple as possible. A

Mac Microsoft Basic

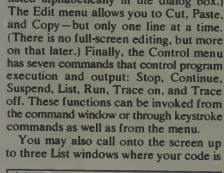
Abigail Reifsnyder

Those of us who have had our Macs for a while have been champing at the bit for more software—one can only do so much with Macs Paint and Write. So it was with much excitement that I opened my copy of Microsoft Basic for the Mac. I soon discovered that Microsoft Basic for the Macintosh is just that: Microsoft Basic—a strict translation whose two best features are that it is Microsoft Basic and that it is out, but whose most remarkable feature is that it does practically nothing to take advantage of the special capabilities of the Macintosh. Sure, it has windows; sure, it uses the mouse; and, yes, it does include commands to let you access the Macintosh ROM routines. But there is more to the Mac than windows and mice.

When you first call up MS Basic, you see the familiar menu bar at the top of the screen, an empty "untitled" window, and a small command window at the bottom. The command window is where you type in commands while the output window displays everything you type in exactly as you type it along with the results of your program as it runs.

The menu bar includes the standard Apple menu with the desk accessories and three MS Basic menus: File, Edit, and Control. The File menu includes six (not three, as indicated in the manual) commands that act on program files: New, Open..., Close, Save, Save as..., and Quit. All of these commands operate in much the same way as they do with MacWrite and MacPaint, warning you in "dialog boxes" if you are trying to do something that will cause you to lose the current file. The one exception to this is the Open... command which expects you to remember the name of the file (or the name of another disk) you want to open. (In both MacWrite and MacPaint, all the files on the disk are listed alphabetically in the dialog box.) The Edit menu allows you to Cut, Paste, and Copy—but only one line at a time. (There is no full-screen editing, but more on that later.) Finally, the Control menu has seven commands that control program execution and output: Stop, Continue, Suspend, List, Run, Trace on, and Trace off. These functions can be invoked from the command window or through keystroke commands as well as from the menu.

You may also call onto the screen up to three List windows where your code is



List window displays portion of simple program which accepts mouse input.

displayed; you can scroll through using the scroll bar at the side of the window. The advantage to having three of them is, presumably, to facilitate comparisons and cutting and pasting among different parts of a program. The usefulness of this feature is limited since you can edit only one line of code at a time; if you want to move a block of code, you are better off just re-entering it. Perhaps, if you were able to run two or more programs simultaneously, this feature would be more useful for comparisons. As it is, it seems to be merely a bell or a whistle, take your pick.

This version of MS Basic does have some special features such as LINE and BOX statements, mouse functions, and double precision variables. GET and PUT statements are especially powerful in this version of Basic, since they allow you to store a screen graphic into an array that can be put anywhere else on the screen. This facilitates such things as dragging a picture around the screen and creating the effect of animating an object. The mouse functions make it easy to write programs that respond to mouse inputs (mouse position, single click, double click and drag).

Unfortunately, these new features do not compensate for the slap-dash feel of this implementation of Basic on the Macintosh. It could be much more than this. Not having a full-screen editor to edit source code undermines the advantages of both the windows and the mouse. In fact, the program works in such a way that the mouse is more annoying than helpful. Another particularly glaring gap in the capabilities of this Basic is the lack of any commands to address the four sound channels of the Mac. (Someone forgot that computers can make noise!)

list of command headings appears on the ruler at the top of the screen. Each heading indicates a category of command. By pointing the mouse to a heading, then pressing the mouse button, the available commands under that heading "pull-down." You may then scroll down through the menu. When the mouse highlights your choice, you let go of the button and that command is implemented.

And folks, take it from me: one pull-down menu is worth a thousand modes.

Mode Indigo

Socrates' wisdom cannot be responsibly challenged, and his statement concerning knowledge and ignorance certainly applies here. The simpler we can make a tool, the more the uses to which it will suggest itself. But perhaps we can take the advice even a bit further. Perhaps true wisdom comes by sifting the *pertinent* facts from the *impertinent* facts.

Impertinent facts are a distraction from the knowledge at hand and detract from insight—detract from clarity in the expression of what we *do* care to know. For a pertinent example, we might consider the concept of "modes" in conventional computer software.

In a typical word processor of any real power, there are multiple command modes, each with its own set of subcommands. To make even the simplest change to existing text, you must know all about available command modes and how they work. Every minute of the sidereal day someone makes a mistake on a computer and mutters some variation on the line, "Shoot. Wrong mode."

Or consider the idea of embedded command codes. As we scroll our way through life, we insert numerous tiny monstrosities like .pa and .np and .ul into our text, and accept these as commonplace, necessary evils. They are not English. They have nothing to do with the actual matters at hand. Yet they are frequently the root cause of wasted revision time, i.e., "Shoot. It should have indented there, but I forgot the period in front of the .pa code."

Parochialists wonder what the problem is with modes. Sure, they require real effort to understand, and nothing about them is in the least bit intuitive. But effort is what separates the wheat from the chaff, right? The men from the boys. The smarties from the dummies. If you can't learn about modes, then maybe computers aren't for you.

Understand?

Certainly some users would prefer to be perceived as micro-Merlins. Perhaps the more cryptic a command code, the better. This category of user perceives the eventuality of real democratization of computer power with something akin to melancholia.

Imagine how depressed the very first auto owners must have been when the Model T started popping up everywhere. It became harder to feel superior.

But the fact of the matter is that even for those of us with the faculties to comprehend cryptic command codes and modes, the way of icons, windows, and pull-down menus is a better way. We do not care to waste time reminding ourselves that CTRL-D deletes in the insert mode but implies a DOS instruction in the command mode. These are impertinent facts—facts we are *the more intelligent for being without*. We are much better served when thinking about an *application* itself rather than about the applications program that frames it.

A Four-Year-Old Can Understand

The notions of the pull-down menu, adjustable-sized window, pointer-based icon system, and document "stacking," are generally credited to Alan Kay, founder of the Learning Research Group at Xerox's Palo Alto Research Center. (Kay has spent the last two years at Atari, but shortly before press time announced he was leaving to join Apple computer. One can only imagine what this alliance may foster.)

Kay's great leap of faith was to embrace Socrates' principle—to embark upon the design of a computer that could be learned, and then productively used, in minutes.

To put the case more clearly, Kay's ideal was to design a computer that a child could not only use, but *want* to use. Kay knows that adults will put up with all sorts of bilious gobbledygook in order to work with computers. A child will not. He will either produce real results without formal training, or he will lose interest and walk away.

And so at PARC, and later at Apple, development progressed on a computer system so straightforward, so intuitive, that adults and children would not only comprehend, but embrace it.

What is all the ballyhoo about the Apple Macintosh, you ask? Why the hue and cry? Why the excitement over this crazy-looking little beast? I have tried to explain, but it would be best if you got yourself to a Macintosh sometime soon. Give yourself a half an hour, and you will then have a better idea of what the power of the machine truly is.

If, after a session with it, you *still* have no concept of what makes the Mac the most promising computer introduction of the '80s, don't despair. You have simply been sitting in the blue glow of the Orwellian viewscreen with the other drones for far too long. Get yourself a four-year-old child, and ask him to fill you in.

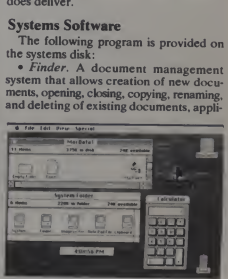
But there we go with that word "promise" again. Better be careful. For as it stands, the Macintosh is a more powerful machine for what it *promises* than for what it delivers.

Let us now examine exactly what it does deliver.

Systems Software

The following program is provided on the systems disk:

• *Finder*. A document management system that allows creation of new documents, opening, closing, copying, renaming, and deleting of existing documents, appli-



Display of some systems functions.

The Print function is less than obvious. For example, if you pick Print from the main menu, it merely opens the file you chose. That's it. I don't understand why Print is even on the menu. (To print the file, you have three options once you open the file. You can use the Save as... command and save it as LPT1 choosing the ASCII option. Or you can enter llist in the command window. Finally, list, "lpt1:" will print your file.)

Also, while you can print the entire screen, everything in the List window, and anything sent directly to the printer by the running program, you *cannot* print the output window. As a result, a program which displayed the textfaces available via routines in ROM in the output window was unable to print them. Printing the entire screen gave only the textfaces currently on the screen, and sending the list output directly to the printer resulted in a complete list, none of which was in the appropriate face.

On the other hand, a convenient feature is that you may save a file three ways: as ASCII, Binary, or Protected. Once you save a file with the protected option, you cannot modify it in any way.

One final complaint: the manual. It is adequate to get you started, but much too much space is devoted to explaining such things as how to comfortably view two List windows simultaneously. Meanwhile, the "Macintosh Toolbox Support" appendix consists merely of a listing of commands with no indication as to what they will do for you. This is typical of this package as a whole: there's nothing really wrong, but there's nothing particularly right either. For $150, I think it's fair to expect a little more to be right.

cations, and files, and movement of same on or between disks and folders. Folders allow documents to be arranged hierarchically. Finder allows you to obtain directories by icon, name, date, size, and kind.

The following systems functions can be called up during Finder or any other application, and concurrent with each other:

• *Calculator*. Looks, and works, just like an actual calculator. Results can be cut and pasted into other documents or applications. Numbers can be entered from the keyboard, numeric keypad, or using the mouse to point and click screen "buttons."

• *Clock*. Shows the current date and time. You can copy the date and time to paste into other accessories or documents. You can also set an alarm function.

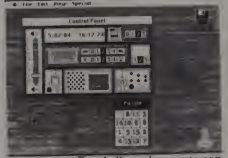
• *Key Caps*. Allows you to use the mouse to enter text. Its real utility is to display available special graphics characters obtained by holding down the OPTION or SHIFT key.

• *Puzzle*. A pure bit of whimsy. Something to play with when you need a break. A sliding tile puzzle simulation that will take you back to your childhood. Documentation quote: "unfortunately, you can't pry out the little plastic tiles when you get frustrated."

• *Note Pad*. A place you can jot down a few notes and keep them separate from the document you are working on. Or type text and edit it even if you are using an application that doesn't allow for text editing. Using the cut and paste option, you can move text from the notepad to a document or application.

• *Scrapbook*. A place to keep pictures and text you use frequently. This might include your letterhead or even a "moused" version of your signature. A graphic equivalent to the text storage of Note Pad.

• *Control Panel*. Lets you set system defaults, including speaker volume, date and time, blink rates, key repeat rate, keyboard touch, mouse sensitivity, mouse double-click speed, and desktop graphics pattern. Most control pattern settings are remembered even when the system is powered down.



The Control Panel allows the user to configure Mac defaults.

The following packages are offered free for a limited time to the Macintosh purchaser:

• *MacPaint*. The most powerful monochrome graphics system ever offered on a microcomputer, MacPaint is the showcase program for the Macintosh and currently the best available demo of the capabilities of the machine. It gives you a set of tools (Figure 5) that allows you to create sophisticated screen graphics in seconds. Contrary to the opinions of some reviewers, I believe MacPaint does provide dramatic new abilities even to those who lack underlying skills. Perhaps you literally "cannot draw a straight line"; the Mac will make sure the line you draw is straight. I have been needing a tool like MacPaint for a very long time, without even knowing it. Now in 20 minutes I can create charts and diagrams that would have been scrubbed before the Macintosh appeared because of the time and effort they would have required.

MacPaint is an image processor that handles images in the way that a word processor handles text. Its resolution is extremely good. Figure 6 is an example, drawn in about 40 minutes by Karen Brown of our typesetting department. Figure 7 took her about half that time. Total effort was nearly an hour.

As a graphics aid, MacPaint is a serious tool. And as a toy, it is exquisite. It is the ultimate executive doodler.

• *MacWrite*. The ultimate "see what you'll get" word processor. Easy to use, yet powerful. Does most things you might expect, including moving blocks of text, find and replace, line spacing, headers and footers, centering, margins, page numbers, justification, tabs, and decimal tabs.

In addition to the expected functions, MacWrite has some special functions all its own.

For starters, what you see on the screen is exactly what the finished document will look like. There are no embedded codes. Because even the "text mode" of the Macintosh is entirely bit-mapped as hi-res graphics, you can look at the CRT and see the printed page.

In addition, you may choose between multiple fonts, multiple point sizes, and multiple style options including bold, italic, underline, and "shadowed" text. If and when you choose to reformat a document, changing a margin or line-spacing, the document reformats right before your eyes on the screen. There is no guesswork with MacWrite concerning the look of the hard copy. If you are coming from a word processor that would print an entire document underlined because you forgot a single closing underline control character, you will find MacWrite an extremely refreshing development.

All text selection functions are performed by the mouse. Position and click, then move through the text you want to mark and it will automatically be highlighted. Position and click. Now you can cut and paste, move, delete, copy, change font, point, or alter typestyle of the selected text.

To change formats within a single document, you simply insert a new ruler, reflecting the format change. If you wish then to return to the original format at a

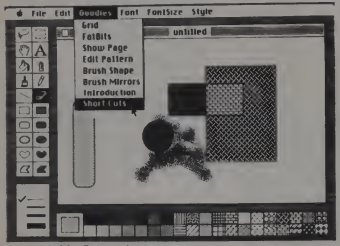


Figure 5. MacPaint palette.

Figure 6. Single portrait manipulated by MacPaint.

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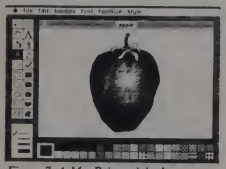

Figure 7. A MacPaint original.

later point in the document, simply copy and paste the original ruler itself at the point you desire.

You may also paste graphics created with MacPaint directly into MacWrite files.

Other Announced Software

In addition to these two already released packages, Apple has announced the following packages for release soon:

• *Mac Terminal*. A terminal communications package for the Macintosh.

• *MacDraw*. A business graphics package.

• *MacProject*. A project management system for supervisors.

• *Macintosh Basic*. Apple's version of the popular programming language will allow a program trace to run alongside a listing in one window, while the program itself runs in another.

• *Macintosh Pascal*. Apple's Macintosh Pascal will be interpretive rather than compiled, which may make Pascal a popular Mac programming environment.

• *Assembler/Debugger*. What every 68000 aficionado is waiting for.

• *Macintosh Logo*. Announced for release in the fall.

Microsoft has announced several Macintosh packages for imminent release, and Microsoft chief Bill Gates has voiced a serious commitment to support of the Macintosh machine. We wanted to get a look at Macintosh *Multiplan*, the popular linking spreadsheet package, but no release copy was available at press time. We did manage a look at Microsoft Basic for the Mac (see sidebar). Other packages promised by the company are *Chart*, a business graphics package; *Word*, a word processing program; and *File*, a database management system.

There is that word again—*promised*. We were promised a copy of *Multiplan* nearly two months ago and have yet to see it. That sometimes happens with promises; they get broken.

Taking the Bads with the Goods

The astute among you may have detected by now that I have been storing up my criticisms of the Macintosh—holding them in abeyance until the full complement of Mac "goods" was laid before you. It should be obvious to you now that the Mac does represent a significant breakthrough, both in hardware and in software.

It should also be clear that the true concern is whether the machine will live up to its undeniable promise.

Fine. It is now time to lay out the "bads."

• *The Macintosh does not have enough RAM memory*. To those of us used to 48K and 64K machines, 128K may sound like plenty. But that is a rather misleading statistic. Between the video display, operating system, and an application like MacWrite, when booted, you are left with little more free RAM than a typical Apple IIe.

The answer we have heard regarding this complaint is that when 256K RAM chips become available, you will be able to upgrade your Macintosh to 512K. This is a promise that will undoubtedly be fulfilled. The question is *when* 256K RAM chips will become available, and how much they will cost. An optimistic guess might be Christmas or so, but you never know. We are depending on the Japanese to provide us with plentiful 256K technology.

As for cost, well, chips are expensive when they're newborn. At the outset, 256K RAMs might cost upwards of $80 apiece. That would make the Mac memory upgrade quite a costly one. And who knows what Mac owner demand might do to RAM chip prices?

The bottom line on this point is that it might be two years or so before you can inexpensively give your Mac enough RAM to be truly useful. And it is possible that large-scale software development for the Mac will be stalled until 512K systems become standard.

• *Single microfloppy storage is slow and inadequate*. One arena where Apple has not fared well of late is in custom drive configurations. Sony drives on other systems run quickly and silently. That is why I was surprised that the single-drive Mac system is so slow and cumbersome. Creating a new startup disk seems to take an eternity, and repeated disk swaps are the norm.

As with the RAM situation, 400K storage is a misleading figure. The operating system takes up fully half of that, and a typical application program, such as MacWrite, another 50K. That leaves little more free disk space than on the typical Apple IIe drive.

External disk systems will not be available for some time, as the limited supply of existing Sony drives must be earmarked for new Macs. And even the availability of the external drive will not transform Mac storage as dramatically as one might hope.

The best answer to this problem is the promise of the Sony double sided drive. This could become the default external drive system, to be used in conjunction with the existing single sided internal drive.

Certainly some type of hard disk will play a big role in the Mac's future, and as all software applications we have seen so far have been released without copy protection, application programs could be moved over to hard disk easily. Davong has announced a third-party Mac Winchester drive for release soon.

I must also register displeasure with the disk ejection procedure. To remove a disk from the drive, you must close everything down, quit your current application, and request an eject from systems software. I understand that this procedure is for my own protection, but it is a drag. In a way it reminds me of 1975 cars. Remember those? They wouldn't start unless you had your seatbelt fastened.

Everybody ended up hot wiring them to get around the interlock—even people who wear seat belts. I can just imagine a pile of unbent paper clips sitting in front of every Macintosh in the nation.

• *There are no internal expansion slots or external expansion busses*. What's the big deal about that, right? The Mac already has everything you need. Well you might have said the very same of the old Apple II back in 1977. So many expansion slots, way back when there was no firmware to plug in them. That situation changed quickly. Nowadays many Apple owners wish they had another three or four slots. By precluding easy hardware expansion on the Mac, Apple writes off a major component of its early success—expansion flexibility. Sure, it might take some imagination at first to envision the kinds of cards the Mac might need. But if an expansion bus were available, people would start to invent them.

On the same score, it is lamentable that the Mac does not sport an internal modem standard (or at least the capacity to add a modem internally). The circuitry is much less expensive than it typically sells for and is certainly compact enough to have fit inside the Mac. To charge an extra $300 for the external Mac modem almost suggests—I shudder to say—tactics typical of Apple's main competitor.

• *MacWrite has some severe limitations*. Although MacWrite has some very refreshing features and is a joy to use overall, it is not a serious word processing tool. Part of this relates to the RAM and disk storage shortage of the machine. I was flabbergasted to discover that the 128K Mac is capable of supporting MacWrite documents no longer than 10 pages in length. After it reaches the last available byte, it will accept not one more character. And to make matters worse, document files cannot be chained.

Other problems, however, will not be remedied by a simple RAM upgrade. Lack of directional cursor keys, for example, was to my mind a major omission. I under-

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New Grist for the Mill

Arlan Levitan

Aside from all of the conjecture by professional micro watchers about whether the public, computer dealers, software houses, and businesses are ready for a machine as radical as the Macintosh, there was one sector of the industry that was well prepared: The Rumor Mill. The first Macs had no sooner been barely burned in by their new owners, than the Mill embraced the new machine and went into full production.

The undisputed leader in the rumor race is system memory. Tales abound about late year introduction of a "Fat Mac" with 512K of memory. Although perfectly serviceable, the present 128K system does present some limitations, particularly in a single disk drive configuration. Swapping disks during the process of back-up upwards of 20 times is nobody's idea of fun and games and takes at least five minutes per disk, even for the most fleet-fingered user.

Additional memory will aid more than just disk duplication. Although a fairly straightforward memory management system allows programs whose total size exceeds memory to run on 128K Macs, execution is slowed considerably by the amount of disk access involved in such operations. More RAM will significantly speed up the execution of programs that rely on overlays at this time.

To top things off, Mitch Kapor of Lotus Systems has flatly stated that their "1-2-3 like" product for Mac that will hit the streets late this year or first quarter of '85 will require 512K to run at all.

The culprit here is ol' Adam Smith's law of supply and demand. Apple intended the Mac to be released as a 512K machine, but industry predictions of the availability of 256K dynamic RAM chips fell short of the mark, and as a result, type 41256 RAM chips still command prices of $60 to $85 apiece. Since the popular 4164 series 64K chips are going for $5 or less these days, don't expect to see Fat Macs floating around in quantity until 256K chip production is well ramped up and prices fall to at least half of their current level.

Apple has maintained a generous attitude toward upgrades for its installed base of users in the past, and their Mac minions will be no exception. Loose talk in the most popular watering holes of Cupertino pegs the cost of a 128 to 512K upgrade at about $700. Since the Mac memory chips are soldered directly to the system board, the upgrade will consist of a complete system board swap, with the old boards being returned to the factory for retooling. Do-it-yourselfers would be well advised to leave such an upgrade to their local dealer. The system board is a four-layer affair, and even Mr. Wizard would have a hard time not bungling that amount of delicate solder sucking and re-installation.

Second place in the rumor sweepstakes goes to the introduction of double-sided drives with 800K total storage capacity as soon as Sony can supply them in quantities in line with Apple's requirements. Best guess on availability at this point is early 1985. Even more interesting are claims being made by some hardy souls, who have pried open their Macs to poke around inside, that with a simple retooling of the Mac faceplate there is just enough room to cram two disk drives instead of one in the system unit itself. Sources at Apple refused to deny the possibility of such a move in the future.

Expect to see third party external drives competing with Apple's own $500 add-on by mid summer at prices that may force Apple or its dealers to cut at least $100 off the selling price.

RPN (Reverse Polish Notation) operation was dropped as an option on the Finder's Calculator at the last moment. Don't believe it? Check out the calculator on the Guided Tour disk.

A new release of the *Finder* is reportedly in the works and will be ready to be shipped by Fall. Finder updates will require a trip to your dealer.

If you think that students purchasing their systems through the Mac College Consortium program are getting a bargain, the sales people at your local Apple dealer are said to be getting an absolute steal through a program called Own-a-Mac. Absolutely unimpeachable sources tag complete systems consisting of a Mac system unit, Imagewriter printer, MacPac carrying case, MacPaint/MacWrite, Microsoft *Multiplan*, and a box of ten disks at an otherwise unbelievable $1100! Looks like Jobs and company are taking no chances in generating a high degree of sales force enthusiasm.

To round things out, an extremely high-resolution RGB color monitor version of Mac is said to be in the wings for spring 1986. By that time 512K black and white Macs with double-sided internal drives will be going for less than $2000. Price of the Rainbow Mac is rumoured to be currently targeted at $2995. But why wait two years when you could be Mac'ing around right now.

stand and appreciate that the mouse is quite capable of handling this input for me. But when all I wish to do is move the cursor to the lefthand margin and up six lines, I would like to do it without having to remove my fingers from the keyboard.

Many application functions on the Mac make use of "expert keys" to allow shortcuts through nested menu selections. My general understanding of pointer philosophy has always been to offer a choice. *Both* means of control should be constantly available, so that the decision of how to input is left to the user. To have eliminated keyboard cursor movement entirely from MacWrite is in my opinion a flagrant example of mouse chauvinism on the part of Apple.

MacWrite will not calculate a word count, has no spell-checking, merge, or hyphenation capability, and will not allow a column width wider than 80 characters.

In short, MacWrite in its current form is too limited to be of real use to anyone who does a lot of writing.

• *The system is monochrome-only.* Despite rumors to the contrary, (see sidebar) the Macintosh is likely to remain a black and white system. The circuitry to drive a color printer is already in place, but don't bother holding your breath for an ultra-hi-res RGB tube to replace the current Macintosh CRT.

• *MS-DOS compatibility is ruled out.* As I have said many, many times, though MS-DOS may be a mediocre standard, it is a standard nonetheless. Apple has decided to challenge IBM on this and could not have started off on better footing than it has with the Mac. But if it is IBM compatibility you have in mind, don't look to the Mac. If you must have an IBM-compatible Mac, you can buy a Compaq and plug it into the same power strip.

• *The Macintosh will not multitask.* I mention this not as a criticism, but because it is a fact largely overlooked by Mac reviewers. The main difference between the Mac and the Lisa is that the Lisa can run more than one program at a time. Not so the Macintosh. You may open multiple document windows from MacWrite or from the Finder. But whatever multitasking abilities the Mac finally inherits will come from cleverly designed software modules—not from within the Mac itself. It is a tribute to Apple's marketing that this fact has remained so obscure.

• *You can't use a Mac away from a desk.* Unless you have a place to do your pointing, you won't be going very far with your mouse. It would be nice if Apple or a third-party company were to offer a MacBall trackball, so that the Mac could be used in bed, reclining on the couch, or in the back seat of a Buick. Our artist/typesetter Karen Brown said she would have preferred using a graphics tablet to compose her drawings. Perhaps Koala

Technologies will remedy this situation shortly.

• *MacPaint has an easel size limitation.* The screen window cannot be re-sized from MacPaint; it presents a 4" x 6" window on an 8 1/2" x 11" page. It is still quite possible to draw shapes larger than the window size, but the process may seem disjointed and cumbersome.

• *Forget about external video.* Because of its non-standard ultra-high resolution, there are no plans to offer a larger, external Mac monitor. The lack of an external video connector jack bespeaks this. I feel this may change as the Mac enters college classrooms, however. Having taught my share of microcomputer courses, I can vouch for the tremendous help a second monitor can be when 40 students all need to see the same screen at the same time. With the Mac going into colleges and universities nationwide, a remedy to the external video restraint may be forthcoming.

• *Macintosh software development is an involved process.* Although many interface aids are offered in ROM, development and debugging of Mac programs is currently slow going. Witness the delays from even the largest and smartest software houses around. Because the Mac strives for such high standards, it calls for the absolute most from the absolute best. As a result, it is unlikely that Macintosh software packages will flood the market before the end of the year.

I have never criticized a new machine for the lack of software. When the IBM PC came on the scene, there was literally nothing available for it but a buggy word processor. The Macintosh debuted with MacWrite and MacPaint, both of which have been thoroughly debugged, and these programs promise an unbeatable standard of software quality.

Closing Arguments

I simply wonder if this standard can be upheld. The thought first occurred to me as I played around with Microsoft Basic. A Basic program running on the Mac looks very much like a Basic program running on any other machine, except for its windows. Without the icon/window/menu shells, the Mac is reduced to a rather average machine.

It is up to talented programmers to make the most of Macintosh ROM in every program they develop. With it they can meet the ambitious promise that is the Apple Macintosh. Otherwise the Mac may never develop the staying power it needs.

We are still quite some distance from the ideal machine Alan Kay envisioned back in 1971 and christened the "Dynabook." This is a computer the size of a Model 100 with the power of a hundred Macs. In a recent interview, he rather cynically predicted that it would be the Japanese who would make the Dynabook a reality. He told Allen Munro of *St. Mac* magazine that the Macintosh was in point of fact "no big deal."

That's the problem with people who are vastly ahead of their time. The times never seem to catch up. The Mac clocks in at 8 MHz, but Kay is already imagining what he could do with 12MHz. In my last vestiges of prideful nationalism, I only hope it is Apple, not NEC, that introduces a 1000K 12 MHz machine two years from now. Perhaps I will write about it using a truly professional word processor running on a 512K hard disk Macintosh.

Of course Kay will still be cranky with it, even when it does happen. If only he had *20 MHz* and *5000K* in a case the size of a box of Milk Duds. Then he could really make things happen.

Well if anybody can pull off *that* kind of miracle, it is probably Apple. Those folks show a lot of promise. ■

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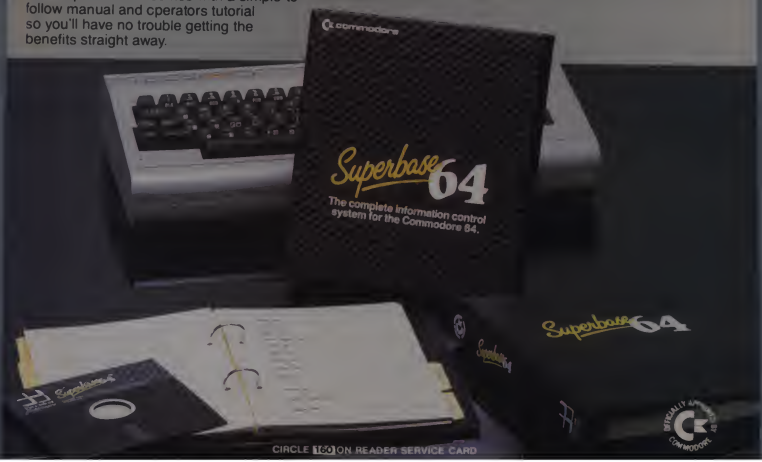

CIRCLE 150 ON READER SERVICE CARD

Inching Closer to the Perfect Portable

Hewlett Packard HP 110

HARDWARE EVALUATION

John J. Anderson

The kinds of tasks to which men and women have assigned computers have always been related more directly to the size of the computer than to the size of the task. Sure, you can't solve differential equations in 1.5K (spare me the letters, I may be wrong). But I am speaking of size here as *proportion* as opposed to *power*.

On the one extreme: the mainframe the size of a nuclear submarine. Impressive, but hard to love. On the other, the credit card calculator. Cutest thing you ever saw, but rather limited.

I play from time to time with a Sharp PC-1250 handheld computer, and it is fun to see just how much code I can cram into 1.5K. But the machine doesn't have a whole lot of utility in the real world. Its tangible contribution was to help set the stage for more powerful and more refined miniaturization.

Despite the current limitations of most portable machines (and I mean by this term internally powered "notebook computers," not the Hernia-1065, which OEMs sewing machine cases from Singer), the category has managed to catch on. Perhaps we should pause to reflect for a moment on why this is so.

The Mind Appliance

What *can* computers do, anyway? What good can they do for actual human beings on a day-to-day basis? That is the question that portable designers are attempting to answer, and the better the answers they give, the more portable computers they can sell. People have begun to realize that having a computer tag along with them is quite a helpful concept. There is no certainly no threat in a plastic computer the size of a dictionary sitting on your airline tray table. It zips into a carrying case just like your toiletry kit, and you are much more likely to hurt yourself with your razor.

Since May of 1983, I have been raving about a portable computer called the TRS-80 Model 100. In brief, its answers to the question posed above are as follows. It can:

- Provide bare-bones word processing with a tolerable screen size.
- Maintain a database.
- Dial the phone from a list of stored numbers.
- Keep time and maintain an automatic calendar.
- Keep track of appointments.
- Act as a terminal for communication with mainframes and other micros.
- Provide Basic so you can program your own applications.

This was a good set of starting criteria, and the market agreed. Other

manufacturers straightened up with a snap. The portable market had been born.

My Model 100 has 32K, which seemed like quite a lot for a portable—until the subject at hand arrived. Sure, I ran out of memory every time I roughdrafted an article such as this one, but you have to live with that kind of thing, right?

Okay; this is not a Model 100 review. I am using the Model 100 as a unit of measure. Its capabilities have become the standard by which to measure new competitors.

When I first reviewed the Radio Shack Model 100 in August of 1983, I heralded the success of the machine as a direct result of its increased screen size. As opposed to its predecessor, the Epson HX-20, the Model 100 gave you 40 columns by 8 rows—the kind of screen size you needed to actually get some work done.

At the time, I gleefully anticipated the advent of larger LCD screen sizes. I predicted that portables' screens would come to reside in the flip-up lids that protected their keyboards and that with each increase in screen size, the machines would become more desirable.

That was not a difficult prediction to make, and by the time Dave Ahl put together the notebook computer issue of *Creative Computing* in January 1984, fully four flip-up models had been announced (see sidebar).

Dream Machine

Also appearing in that January issue was a piece by Dave called "The Ultimate Notebook Computer." Described in some detail and depicted as an artist's conception was a dream machine of major, albeit diminutive, proportion. It was an imaginative aggregate of all one might want from a notebook portable. Large display, large memory, built-in software of great capability, modems, adjustable screen angle; the list went on.

When the Hewlett-Packard HP 110 showed up at the lab a few days ago, I was agog. I had heard that HP was going to do a notebook portable, but was totally unprepared for what I saw.

My thoughts ran again and again to the "ultimate portable." We have seen a heck of a lot of notebook machines around here, and some of them have been rather impressive. We really *use* notebook machines here (the first draft of this piece was composed on one), and we know how they stack up.

So I'll quit the long winded buildup and move straight to the central theme: the HP 110 is quite simply the finest notebook computer available on the market today.

It doesn't attempt to impress with $5000 plasma displays or touch screens or mice or icons or even the sexiest designer styling you will ever see. If offers instead sheer power—more power than nine out of ten current desk-top systems by my thumbnail accounting—and the sexiest ROM software you have ever imagined.

The 110 offers unbelievable set of specifications in an off-white box 13" wide by 10" deep by 2-7/8" high, weighing 9 lbs. 2 oz. I dare say you may have trouble suspending disbelief at a description of the features of the HP 110. It sports a CMOS (complementary metal oxide semiconductor) 8086 microprocessor. This a true 16-bit microprocessor with a 16-bit data bus. It runs at a clock rate of 5.33 megaHertz. That is fast.

The HP 110 features 272K of non-volatile CMOS RAM. That means that you can turn the machine off and a trickle charge keeps your information intact within RAM memory. Another 8K of RAM is dedicated to the screen display. This is a highly legible LCD screen at 80 characters by 16 rows. With twice the horizontal and vertical resolution of the Model 100, the HP 110 display makes a Model 100 screen seem positively claustrophobic. (In fairness, although the Model 100 makes an excellent yardstick, it is probably unfair to compare it point for point with the HP 110. The 110 beats it cold and also costs four times as much.)

How they crammed all this stuff into such a pretty little case is beyond me. I wanted to take a screwdriver to it, but had second thoughts. Not only is it rude to dismantle a prototype on the first date, but a mishap could end in tragedy. So we'll follow up with a look inside the HP 110 at a later date.

And legible LCD display? Talk to me about legible LCD displays. The font is not only clear but extremely handsome with thick and thin strokes that emulate a printed typeface. The 110 can plot 480 by 128 pixels in the bit-mapped mode, and screen contrast is controllable directly from the keyboard.

It features 384K of CMOS ROM. These are not typos, folks. Another 8K of ROM is devoted to configuration and serial number.

What is nearly 400K of ROM used for? Well, an utterly complete version of *Lotus 1-2-3* resides inside the machine, for one thing. That is the number one selling integrated spreadsheet, statistical graphics, and information management package. Also in ROM are *MemoMaker*, a full-function word processor; *Personal Applications Manager* (a menu-based MS-DOS shell); and a terminal communications package.

In addition to this built-in software, there is the MS-DOS 2.11 operating system. This makes reams of existing software, including programs from the HP 150 touchscreen desktop computer (reviewed in the April issue of *Creative Computing*), a distinctly compatible possibility. It also makes the HP 110 compatible with other MS-DOS machines, like uh, the IBM PC, for example.

And because all this software resides in ROM there is more RAM room left to these applications on the HP 110 than most any other machines on which you might imagine running them.

The keyboard is a half-stroke, Selectric-style 75-key matrix, with eight

HARDWARE PROFILE

Name: Hewlett Packard HP 110
Type: Portable microcomputer
CPU: CMOS 8086, 16-bit
RAM: 272 K
ROM: 384K
Keyboard: 75-Key Selectric-style half-stroke
Operating System: MS-DOS 2.11 in ROM
Display Resolution: 80 characters by 16 lines, 128 x 140 pixels
Ports: HP-1L, HP-1B, serial RS-232, printer, modular phone
Dimensions: 13" x 10" x 3", 9 lbs.
Documentation: Preliminary at time of evaluation.
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special-function keys. We shall take a closer look at the keyboard up ahead.

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From the main applications menu, you get an automatic display of battery condition. If power drops to less than 1.5 hours, a low battery indication is displayed every eight minutes. If the power dips below five percent, the machine shuts itself off and can be powered back on only when the AC adapter is attached and functioning.

As you might have extrapolated in your growing awe by now, a modem is indeed built-in to the unit as well. It is a 300 baud direct-connect modem with auto-answer and auto-dial, and it is capable of producing both pulse and tone dial signals. It functions smoothly and simply with the built-in telecommunications software.

The system also sports a built-in clock/calendar, of course, with calendar capability through December 31, 2079. After that you'll require a ROM update. Clock resolution is to a tenth of a second, with an accuracy of two minutes per month under normal conditions. Multiple alarm and appointment keeping functions are provided. Whenever an application ruler is invoked, the time appears near the center of it—a very nice touch.

In addition to all these features, it must be mentioned that the HP 110 is absolutely the sturdiest portable we have seen to date. While we did not drop test it from a height of three feet onto a concrete floor, we were told that the 110 can withstand a 100-g force on all six sides. It will withstand operating temperature extremes of 32 to 115 degrees Fahrenheit (0 to 45 degrees Celsius). If it gets hotter or colder, best to shut it off and shove off.

For scientists and technicians on-site, the HP 110 is probably the first practical means of bringing a serious and powerful computer *to the problem* as opposed to the other way around. It is built to withstand tough field conditions that no other portable would survive over term.

Hewlett Packard has always had very exacting quality standards for its hardware, and the Model 110 is in no way an exception. But the story just begins with the Model 110 itself.

Perfect Portable Peripherals

A special machine deserves a special mass storage device, and the HP 110 will have one. The HP 9114 disk drive unit is a Sony-format 3½" hard-shell floppy, capable of storing about 630K per double-sided disk. And the unique fact setting the 9114 apart is that it sports an internal battery pack as well, making it the first self-powered and self-contained professional disk drive unit.

One battery charge will see you through six to eight hours of use, depending on the duty cycle. The dimensions of the unit are 11¼" x 8" x 3", at a weight of a mere 5 lbs. 9 oz. The transfer rate is 6K per second maximum with an average access time of 497 milliseconds.

The 9114 drive is still very much in prototype, and so we did not get a chance to do more than read about it, as you are doing. There is no doubt, however, that HP will make good on the promise to deliver—probably around the time you read this.

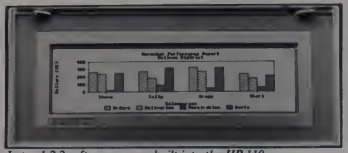
In the meantime, you can connect existing HP floppy drives to the HP 110 using the HP-IL bus, standardized for HP hardware. This makes daisy-chaining of interface loop peripherals trivial.

HP 110 vs. Sharp PC-5000

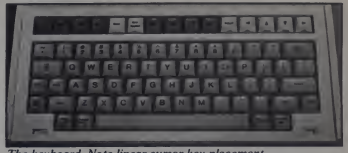
The most obvious comparison to be made with currently available portables would be to match up the features of the HP 110 with those of the PC-5000 from Sharp.

Both machines offer an 80-column flip-up LCD display, MS-DOS compatibility, built-in modem, ROM software, and a carrying weight in the neighborhood of 10 lbs.

The Sharp unit cannot match the basic specs of the HP 110, but then it must be noted that it is $500 cheaper with modem ($2350) than the HP machine. Without the modem feature, the PC-



Lotus 1-2-3 software comes built into the HP 110.



The keyboard. Note linear cursor key placement.

Additionally, the HP 110 contains a standard RS-232C interface for setting up serial devices, and provisions to interface with HP-IB peripherals as well.

Because RAM memory is partitioned into theoretical silicon drives A and B, external drives are referenced beginning with drive C.

As soon as we receive an HP 9114 at the lab for testing, we will provide a follow-up evaluation. At press time we had no pricing information on the unit.

The ThinkJet

Another unique peripheral designed especially to reside along an HP 110 HP-IL chain is the HP 2225 "ThinkJet" printer. Even if there were no HP 110, the ThinkJet would deserve a stand-alone review. It is hardly bigger than the average dictionary and is priced under $500. At the same time, it is a full-function 80-column printer, utilizing state-of-the-art ink jet technology to get the print onto the page.

The ThinkJet weighs less than 7 lbs. and has a footprint of a mere 93.2 sq. inches. It measures 11.5" x 8.1" x 3.5". It accepts pin feed, fanfold, or friction feed single sheets.

The unit is capable of print speeds to 150 cps, with a noise rating of under 50 decibels, which is only attainable at that speed through non-impact inkjet technology.

Four pitches are available, each in regular or boldface mode. International character sets are supported, as are underlining, super-, and subscripts. Text appears in an 11 x 12 dot character matrix. Graphics resolution is to 192 x 96 dots per inch.

Text and graphics print quality is extremely good, as reproduced here (Figures 1 and 2). Print buffer size is 1K, and carriage returns are selectably bi-directional and logic-seeking.

Three versions of the printer will be made available. The HP-1B version is designed to mate with HP desktop and handheld machines, while a Centronics parallel version will service markets outside HP (which could turn out to be sizable). We received the HP-IL version, designed especially to mate with the HP 110. It has a very special bonus—it too sports a rechargeable internal battery pack. The HP-IL ThinkJet therefore qualifies as a truly portable printer. Teamed with the HP 110 and HP 9114 portable drive, the HP 2225 ThinkJet rounds out the first truly portable computer *system* ever offered.

Remember, no computer is truly portable if you can't take it beyond the reach of the longest extension cord you own. If you are researching polar bears in Hudson's Bay or just spend a lot of time traveling, this could be important.

Turning On

Remove the HP 110 from its handsome protective carrying case and snap open the lid just as you would a fine attaché. Adjust the physical angle of the screen to the optimal viewing angle (it will counterbalance to stay at any position you set). Press any key to activate the display. Adjust LCD contrast directly from the keyboard.

You will be presented with the Personal Applications Manager menu. This, and all the ROM software on the Model 110, is menu-driven, using either the eight function keys, or directional highlighting, to make a selection from the menu. At any and all points within P.A.M., Memomaker, Lotus, and the terminal communications package, you are presented with or can call menus to delineate all your options.

Even more significantly, I have never seen a portable computer with anything remotely approaching the level of help that the Model 110 offers. Quite a lot of code can be packed into 384K of ROM—more ROM, incidentally, than any microcomputer has used before.

5000 lists for $1995.

The HP 110 offers 272K of CMOS RAM, while the PC-5000 offers "only" 128K, expandable to 256K. The PC-5000 has a "mere" 192K of ROM, as compared with the HP's whopping 384K. The Sharp uses a "hot" 8088 microprocessor, with an 8-bit data bus, while the HP uses a CMOS 8086, for true 16-bit operation.

The most significant difference between the two machines is probably in the area of screen size: the Sharp sports an 80-column by 8 line display, while the HP 110 offers 80 columns by 16 lines. On this account the HP is without question the winner. The difference may not sound like much, but it makes a very big difference indeed during use.

We did not confirm the theory, but in a torture-test competition, we feel confident that the HP would outlast the Sharp by a wide margin. The Sharp machine does not seem to have been designed with punishment in mind. The HP, on the other hand, comes from a long line of machines built to military specifications.

But there are more than a couple of areas where the Sharp PC-5000 manages to come out on top of the HP. For another $400, you can get your PC-5000 with a *built-in* 80-column dot-matrix impact printer, and system weight then reaches only 12 lbs! The modem unit is unique and includes a module that can be used as a voice handset.

HP could learn a bit about keyboards from the handsome, sculpted keyboard offered on the Sharp machine. It clearly has a superior feel to that of the Model 110. Unfortunately, neither machine makes use of directional function keys. So far the NEC 8201 seems the only portable to get high marks on that score.

Probably the most significant advantage of the Sharp machine is its RAM cartridge capacity. Open a neat little door on the front on the unit, and pop in or out a 128K bubble memory cartridge. These cartridges can hold applications programs as well as operating systems and user data, just like a floppy disk. On the road, this arrangement is more compact and convenient than floppies. Of course if floppy drives are what you want, you can have those too.

The PC-5000 also comes with Basic in ROM and an audio cassette port.

The Sharp PC-5000 is just becoming available in this country, and if it can be distributed successfully, might pose the greatest competition to Hewlett Packard in the category of high-end portables. For a full review of the Sharp machine, see the January 1984 issue.

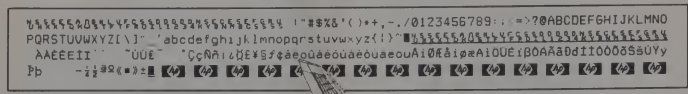


Figure 1.

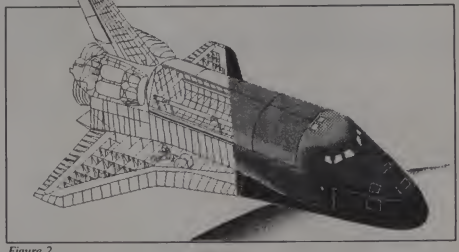


Figure 2.

And help screens get their share of silicon. At any point within any program, you can all up the specific helps you desire. I was able to get going with all the ROM software without any recourse to accompanying documentation. All the documentation you need is right alongside you, on-line. How very refreshing.

Of course *1-2-3* is a complex program, and to make the best use of it, my recommendation is to turn to the manual. What I am saying about on-line *Lotus* helps is that even with a display confined to 16 lines, the HP 110 version of *1-2-3* contains a remarkably helpful set. I am told that a *1-2-3* manual from Lotus will ship with the completed documentation.

And as far as the other pieces of software go, the on-line documentation is all you need. I learned how to create and store documents, save telecommunications configuration files, set the clock/calendar as well as set alarms, and set up directories, all within a couple of hours, and without any recourse to the photocopied preliminary documentation that accompanied our prototype unit.

So the ROM software on the 110 is very easy to use. While it does not have the show-and-tell user interface of the Macintosh, its operation is logical, consistent, and easily mastered. The P.A.M. is designed to be user-configurable. You can load and access the program you want to in the way you want to upon power-up.

But, as no programming language is offered in ROM, you will have to transport one from another machine or from retail disk. I am not a real Basic freak, but I missed the presence of Basic on the HP 110. I would have liked to have made a project of transporting it over from its consanguineous pal, the HP 150, but time restrictions precluded such ambitious plans.

As a result, we were unable to run the Ahl Benchmark on the Model 110. Nor, therefore, will you be designing your own P.A.M. applications right off the bat. Perhaps the inclusion of Basic in ROM would have been a smart move.

But, if you're a Pascalian, Forthright, Logotype, or Lispian, you will be glad to hear that no ROM has been wasted on Basic, and you may airlift in your language of choice.

I did not spend a great amount of time with MemoMaker, but it seems a very serviceable word processor. It is scaled down from its HP 150 debut version and works very nicely on the 110 display.

As with the Model 100, you can gain maximum screen space by clicking off the menu ruler once you have an idea what the function keys can do for you.

Not having worked with any very large files on MemoMaker, I cannot speak for its utility in handling the very big jobs. Judging by its format and its name, I would not recommend writing a novel on it, though I am quite sure you could. However, I think that HP is betting that most Model 110 MemoMaker files will be 25 pages or less, and I would agree with them on this judgement. And MemoMaker works very well on this size document.

The terminal package is excellent, and I spent a couple of enjoyable late evening sessions with the Model 110 on Compuserve. As mentioned above, you can save sets of terminal configurations, including phone number, log-on string, and terminal parameters. Then all you have to type is CSERVE, for example, and the Model 110 will autodial your local access number, put you on-line, send your log-on string, and set you down gently into full duplex. Uploading and downloading of files is straightforwardly menu-driven. And if you get into trouble, the ever-present help screens are at hand.

One of the most convenient features of the HP 110, and one I have always missed on my Model 100, is the ability to set multiple alarms from the clock calendar. Simply define a special file from MemoMaker, indicating the times dates, and messages you would like to include with the alarms. Then, whether

A battery-powered version of HP's ThinkJet personal printer and the battery-powered HP 9114 disk drive.

This is more than a simple trivial pursuit. This is . . .

Pursuit of Knowledge

A Learn-By-Playing Game for Apple II, Apple II+, and Apple IIE computers*.

Pursuit of Knowledge has over 7000 carefully selected and researched questions.

It can be played by one player, or up to 6 players, or teams.

Numerous playing options are available as parameters vary from game to game. Some of these parameters are:

TIMER may be set anywhere from 15 sec. to 3 minutes or not used at all.

LENGTH OF GAME - you predetermine how many questions will be asked or how many points will be required to win.

ASSESSING PENALTIES - you choose point deductions for incorrect answers.

SPECIAL FEATURES:

Pursuit of Knowledge has numerous special features built into the program! The game will be enjoyable for many years. A few of these features are:

STATISTICS - each player or team has their own screen of how they are progressing statistically in the game.

RANDOM SELECTION - the computer randomly chooses which diskette side, as well as the questions that will be asked.

NUMBER OF PLAYERS OR TEAMS can be changed during the game.

CHANGE OF SCORE FEATURE - the computer allows for handicapping or to continue games (which can last for weeks or months).

AND MUCH MORE!

UNSURPASSED QUALITY. The game comes in a luxurious padded vinyl binder to keep your diskettes safe and secure.

Ask your local retailer for "Pursuit of Knowledge". If they do not carry it, telephone or write us.

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* Soon to be available for the Macintosh, PC jr., and other computers.

** Special Canadian edition includes over 1000 Canadiana questions.

Also soon available, "JUNIOR" Pursuit of Knowledge and "GENIUS" Pursuit of Knowledge.

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CIRCLE 127 ON READER SERVICE CARD

the machine is on or off, a pleasant electronic alarm will sound at the preset date and time.

If the machine is off when the alarm sounds, the message will automatically be displayed. If you are working with the computer when the alarm sounds, you are offered the option of moving to the alarm message screen. You can turn off the alarm by hitting a key or it will shut down automatically after about 12 seconds. Up to 16 alarm presets can be set simultaneously.

You can also use alarms to invoke special programs at special times. I would assume that the electronic speaker can be made to beep, hum, or chirp under user control as well.

Hewlett Packard has also announced an initial release of optional software available on 3½" disks. These include:

- Microsoft *MultiPlan*, a multipurpose electronic spreadsheet.
- Microsoft *Chart*, a presentation graphics package.
- *MicroPlan*, a financial package from Chang Labs.
- Microsoft *Basic*.

I have never seen a portable computer with anything remotely approaching the level of help that the Model 110 offers.

- Microsoft *Compiled Basic*.
- Microsoft *Pascal*.
- Microsoft *Fortran*.
- Microsoft *Cobol*.
- MicroPro *WordStar*, the classic word processing program.
- MicroPro *MailMerge*, multipurpose file merging program
- MicroPro *SpellStar*, *WordStar* spelling checker.
- Microsoft *Word*, word processing program.
- Ashton-Tate *dBase II*, a relational database management tool.
- Ashton-Tate *Friday*, an information management tool.
- Link Systems *Datafax*, an electronic notebook program.
- Link Systems *Datalink PC*, a telecommunications software package.
- Dow Jones Market Analyzer, a financial portfolio management package.
- Dow Jones Investment Evaluator, an investment analysis package.

Among the entertainment packages that will be available on disk for the HP 110 is the *Zork* series of adventures from Infocom.

I would have liked to comment on the documentation that will accompany the release system package, but all material we received was extremely preliminary. I cannot comment at all on the final documentation based on what was supplied with the protoype unit.

Nitpicking is My Life, Man

Here is an utterly phenomenal machine with capabilities that leave many of the desktop micros currently available looking rather pale. And yet, there are a few things about the HP 110 that are slightly disappointing. Oh, the joys of being a critic. One thing is for sure, if I am going to pick nits, I prefer to pick state-of-the-art nits. And certainly the 110 fits that category.

Some accompanying PR copy refers to the HP 110 as weighing 8½ lbs. The prototype we tested weighed 9 lbs. 2 oz. Still, that's light, right?

After it has been sitting on your lap for a while, 9 lbs. 2 oz. is enough to cut off most of the circulation to your legs. After it has been sitting in your shoulder bag for a while, you begin to feel a little numb. After you have carried it for a while, the carrying arm begins to feel noticeably longer than the other.

It would be insane to call the HP 110 "too heavy," and I am not doing that here. It is *light as a feather* for a machine with 272K of RAM. And I certainly would not trade it for 128K at 4 lbs., or even 64K at 2 lbs.

Still, the HP 110 is not "light." Find a table when using it for protracted sessions. Switch arms and shoulders when porting it about. And jettison the antiquated pads, appointment books, and portfolios you may consider carrying along with the unit. The 110 is all that you will ever need and all that you will ever want to carry.

The keyboard feel of the unit is not optimal. You may have noticed that I called it a "half-stroke" keyboard above, as opposed to a full-stroke. I said that because the "travel," or distance that a key moves from the unpressed to the fully depressed position, is rather scant. The result is a rather flat feeling that detracts slightly from speed.

The keyboard choice obviously optimized the use of space inside the unit. The more you want a key to travel, the deeper the keyboard "well" you need. Don't misunderstand: the HP keyboard is far superior—in no way comparable—to membrane and Chiclet keyboards. Touch typing is quite possible on it, though an experienced typist might be slightly disappointed with the feel.

The Model 100 keyboard has just a little bit more travel, (a couple of millimeters or so), yet this translates into a much better feel. Perhaps HP might think about a fuller-travel keyboard for its own machine.

I was also disappointed at the linear placement of the cursor keys. It makes them tough to use.

There is no cartridge slot to be found anywhere on the machine. With 384K ROM and 272K RAM, this is not a major consideration. Or is it? If a cartridge slot were available, ROM software changes could be made without requiring a trip to the service department. If a RAM slot were available, there would never be a point at which you were truly out of CMOS RAM. (See the August 1983 and January 1984 issues of *Creative Computing* for more information on the RAM cartridge.)

There is no apparent video bus. It is possible that HP might make Model 110 video output a reality anyway, but I saw no hardware hint or manual reference to

It would be insane to call the HP 110 "too heavy." It is light as a feather for a machine with 272K of RAM.

any type of bus other than the ones described above. That might preclude video capability with the HP 110.

The unit we received would not self-test. Self-testing is an important capability for a machine as powerful and complex as the HP 110, and such a feature is referenced by the preliminary documentation we received. Yet we could not get our evaluation unit to self-test. As we received one of the very first units, we assume this is a ROM problem of our machine alone, and will not be a problem on machines that come off the line.

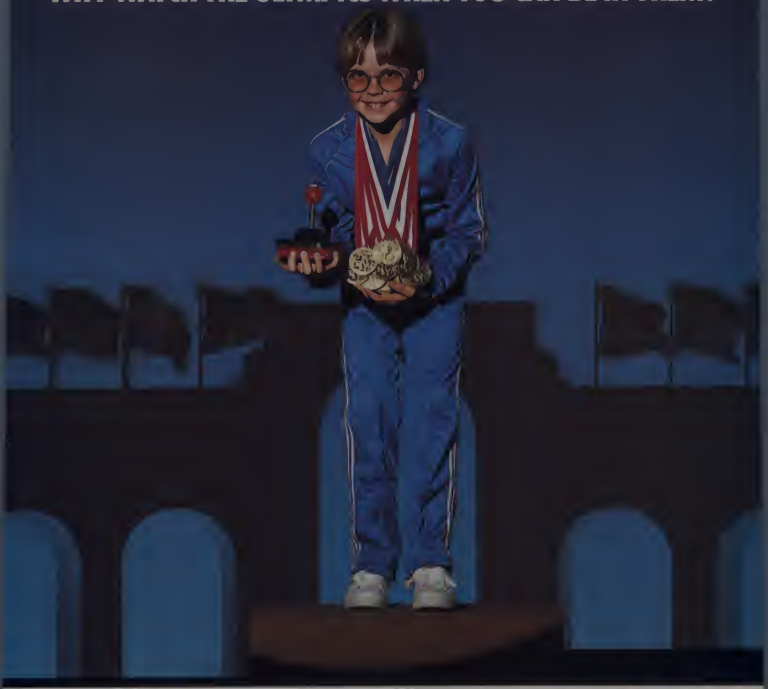
The ThinkJet cartridge requires frequent replacement. Each Thinkjet ink cartridge contains about 3 ccs of usable ink, which is good for about 500 pages of text, before requiring replacement. If you use the printer frequently, it will be important to keep extra cartridges on hand.

The Bottom Line

We don't think these criticisms detract in the slightest from the technological marvel that is the HP 110. If you have $2995 to spend on a portable, there is no other machine to consider. The highest compliment: I was utterly crushed to send it back. ■

CIRCLE 401 ON READER SERVICE CARD

SUMMER GAMES.
WHY WATCH THE OLYMPICS WHEN YOU CAN BE IN THEM?



You're an Olympic athlete competing in eight key events at the Summer Games. How well can you score in track, swimming, diving, shooting, gymnastics and more? So realistic, there's even an opening ceremony and awards presentation after each event.

Unlike other "Olympics-Like" games, Summer Games has incredible realism, superb state-of-the-art graphics and sound effects (including national anthems from 18 countries), and it is a true action-strategy game. In each event you must plan and execute your game strategy in order to maximize your score. It is not just a matter of how fast you can move the joystick.

So change into your running shoes, grab your joystick and **GO FOR THE GOLD!**

One or more players; joystick controlled.

EPYX
COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

CIRCLE 125 ON READER SERVICE CARD

"Dare to

TI makes the best software perform even better.

When choosing a computer, there are two important things to look for. Who runs the best software—and who runs the software *best*! That's why we're staging a dramatic country-wide side-by-side comparison against IBM™ called "Dare to Compare."

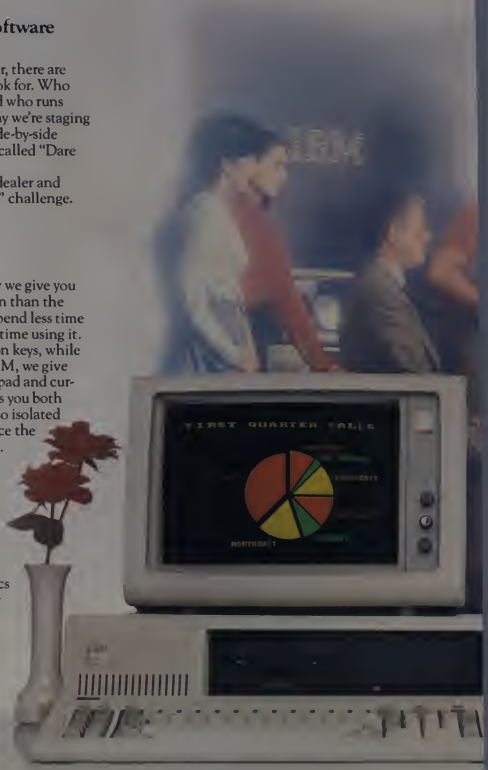
Come to a participating dealer and take the "Dare to Compare" challenge. You'll see first-hand how...

TI makes software faster to use.

Take a closer look. See how we give you more information on-screen than the IBM PC? That way you'll spend less time looking for data, and more time using it. We also give you 12 function keys, while they give you 10. Unlike IBM, we give you a separate numeric keypad and cursor controls. And that saves you both keystrokes and time. We also isolated the edit/delete keys to reduce the chance of making mistakes.

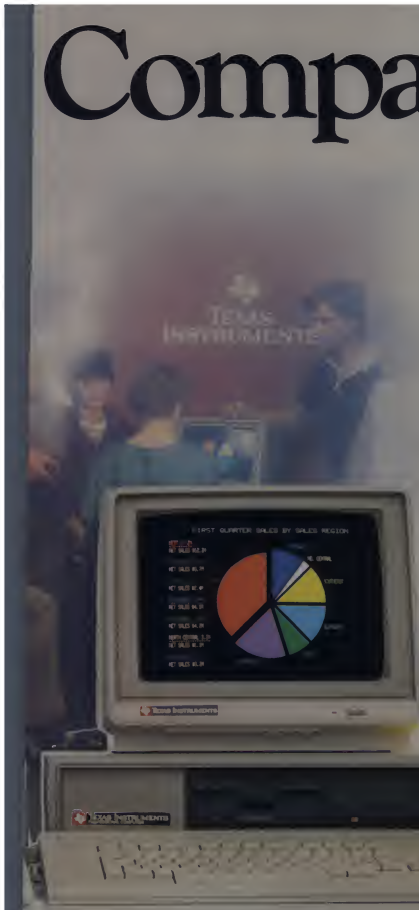
TI makes software easier to use.

TI gives you up to 8 colors on-screen simultaneously, which makes separating the data a lot easier. IBM displays only 4. Our graphics are also sharper. And easier on the eyes.



IBM Personal Computer

Compare”



And TI makes it easier to get your data on-screen. Our keyboard is simpler—it's more like the familiar IBM Selectric™ typewriter than the IBM PC keyboard is.

TI lets you see for yourself.

Right now, you can "Dare to Compare" for yourself at participating TI dealers all over the country. Stop in, present your business card, put both machines through their paces using the same software titles, and see the difference for yourself. We'll give you a TI solar powered calculator, free, just for taking our challenge*.

For the name of a participating dealer near you, please call TI toll-free at 1-800-527-3500, or write: Texas Instruments Incorporated, P.O. Box 402430, Dept.DCA232CC, Dallas, Texas 75240.

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Texas Instruments Professional Computer

DTC 2763-69

NCR enters the desktop market with a novel 8/16-bit German-designed computer

NCR Decision Mate V

HARDWARE EVALUATION

David H. Ahl

The NCR Decision Mate V is an interesting entry in the world of business-oriented personal computers. In its normal configuration, it is furnished with an 8-bit Z80A microprocessor. However, an optional plug-in module is available that converts the machine into a dual 8/16-bit processor with the capability of running both CP/M-86 and MS-DOS. If this option is ordered with the basic machine, it is installed internally. We think this is the configuration that will have the greatest appeal to users, so that is what we tested.

The basic machine includes 64K (expandable to 512K); a 12" high-resolution monitor (monochrome or color); dual 5 1/4" double sided, double density disk drives; and a detachable keyboard. Available as options are a Winchester disk drive, parallel and serial interfaces, and additional memory, as well as a wide range of software.

In a departure from the traditional separate keyboard, display, and system unit, the German-engineered Decision Mate V combines the system unit and display into a single, compact package (14.9" x 18.1" x 14.6"). The CRT and disk drives overhang the base of the unit so the total desk space occupied by the keyboard and display/disk unit is about the same as a TRS-80 Model 4 or IBM PCjr.

The unit we had for evaluation had the 8/16-bit processor option, 128K, dual floppy disks, color monitor, and parallel printer port.

NCR Decision Mate V has display and disk drives in single unit; keyboard is on a four-foot coiled cord.

Low-Profile Keyboard

Upon seeing the Decision Mate V, most people comment about the keyboard. Instead of the familiar sculpted keys found on most full-stroke keyboards, the Decision Mate V has square keys with raised round concave tops. Although the travel of each key is the same as on a standard keyboard, subjectively

New Strategy for the Bunch

It used to be Snow White and the seven dwarfs. Then GE and RCA left the computer business. Today, the five remaining mainframe majors are known as the Bunch (for Burroughs, Univac, NCR, Control Data, and Honeywell).

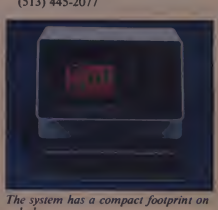
Today, most of the Bunch are scrambling to get into the desktop computer business. But, in the view of Jack Hart, an analyst at International Data, the move "looks like too little, too late."

With 1983 revenues of $3.8 billion, NCR is the smallest of the Bunch companies. Nevertheless, $3.8 billion makes NCR considerably larger than most of the players in the microcomputer industry. Moreover, NCR's strength in small systems—linked primarily to supermarket checkout terminals and automatic bank teller machines—has made it the most profitable of the Bunch companies.

NCR has invested heavily in personal computers and microelectronics and even the semiconductor business. Most of these ventures are not yet profitable, but Charles Exley, Jr., president of NCR predicts that 1984 will be the "year of the turnaround."

HARDWARE PROFILE

Name: Decision Mate V
Type: Desktop business computer
CPU: 8-bit Z80A, optional 16-bit 8088
RAM: 64K expandable to 512K
Keyboard: Detached, 100 keys
Text resolution: 80 x 25
Graphics resolution: 640 x 400 pixels, 8 colors
Disk drives: Two 5 1/4" 320K floppy drives or 10Mb Winchester and one floppy drive
Ports: Optional parallel and RS-232 serial
Operating Systems: CP/M, CP/M-86, MS-DOS
Documentation: Small User's Guide; customized software vendor-produced manuals with applications software packages
Price: $2650 and up
Summary: Capable 8/16-bit system able to run wide range of software; excellent graphics capability especially with supporting DR Graph package.
Manufacturer:
NCR Corporation
Dayton, OH 45479
(513) 445-2077



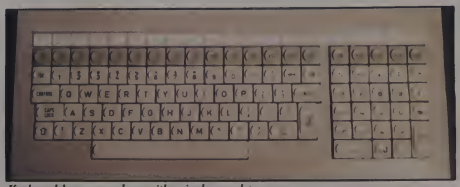
The system has a compact footprint on a desk.

it seems quite different. After a few hours of use, we had no trouble touch typing on the keyboard, but we never shed the feeling that it was "different." NCR tells us that a standard, sculpted keyboard will be available for the machine. On the other hand, it is our feeling that if this is your only computer, you will not have any trouble adjusting to the current unit.

The keyboard is physically divided into two groups of keys although there are the usual four logical groups of keys: alphanumeric, numeric keypad, control keys, and function keys. The alphanumeric keys are arranged in a reasonably standard pattern; there is only one extraneous key that might confuse a touch typist—the backslash between the Z and SHIFT at the left end of the bottom row. The RETURN key is double size and labeled NEW LINE. A second CONTROL key is found over it at the right side in addition to one in the usual place at the left side of the keyboard.

The CAPS LOCK key is a toggle and latches in a down position when it is depressed. All keys repeat automatically when held down for about one-half second. All keystrokes produce audible feedback through a small speaker in the system unit, the volume of which can be controlled (from silent to annoying) with a volume control on the front.

A 17-key numeric keypad on the right provides keys for the ten numerals, double zero, decimal point, four arithmetic operations, and NEW LINE. Also in this cluster are CLR, HOME, and four cursor keys. Unfortunately, the cursor keys are laid out in a horizontal row rather than a more logical diamond or rectangular pattern.



Keyboard has square keys with raised, round tops.

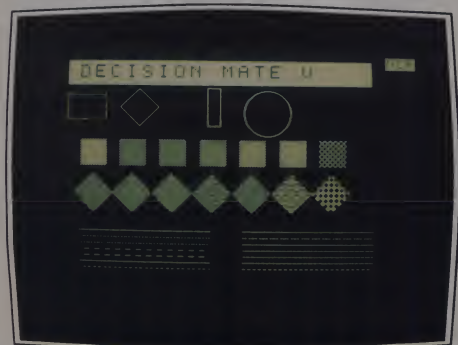
It takes time to get used to the rounded-top square keys.

Across the top of the keyboard are 20 programmable function keys. These are colored a dark gray to contrast with the other keys, which are white with black markings. Function Key 20 is normally set up as a RESET key, but the other 19 have different meanings depending upon the software package in use.

On the right side of the keyboard is a male DB9 connector for a switch-type (Atari) joystick or other controller. This is wired in parallel with the cursor control keys, and the fire button is equivalent to NEW LINE. Although not documented by NCR, we found this a wonderful tool for moving around a spreadsheet program and editing word processing documents and Basic programs.

Right side of keyboard has an "extra" CONTROL key above the NEW LINE key. The numeric keypad has double zero for fast entry of financial data. Unfortunately, cursor control keys are arranged in a horizontal line.

On the bottom of the keyboard is a DIP switch for selecting eight different character sets for English and seven other languages. The keyboard attaches to the system unit by means of a coiled cable with a reach of about four feet—more than enough for lap use. The keyboard has an eight-character buffer which permits rapid data entry without loss of characters.



Display has exceptional graphics resolution.

High-Resolution Display

A high-resolution monochrome or color display is built in. On the color unit that we had, text is displayed in green on a dark blue background. As with most RGB displays, there is only one adjustment for brightness; no others are accessible to the user.

Text resolution is 25 lines of 80 characters. The characters have good definition on the color screen with full lowercase descenders and two-pixel interline spacing. For some reason, in reverse video (dark blue on green), much of the resolu-

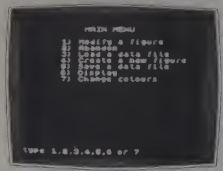


Figure 1. Menu.

Figure 2. Workspace.

Figure 3. Footprint.

creating. That is, if you place the completed figure on a dusty desktop, the footprint is the impression left in the dust by that object.

If you want, you can reposition the base on the drawing board, or you can add another dimension by moving out to the next Z plane. Whereas the X and Y coordinates may be thought of as the length and width of the object, Z is its height. As you move out along the Z plane, you are extruding the box with you.

Unfortunately, there is no way to go backward along the Z plane—if you want to make changes, you must select the modify option from the main menu. When you decide that the box has been stretched out to the appropriate height, you may complete it with either an open or closed top, depending on whether you want to build a box or a block. You are now ready to go to the main menu by quitting.

The main menu has seven items (see Figure 1), but all you want to do right now is to see what you have made. The display option allows you to do just that. By pressing the various arrow keys, you can rotate the object in any direction. This in itself is a truly impressive feature. When the rotate keys are used in conjunction with the commands that let you magnify, reduce, and move the figure, you can view your creation from any angle, any distance, any perspective. At this point, your figure is only a set of connecting lines drawn by the computer. To make your object jump off the screen in an amazing display of 3-D realism, enter the picture mode.

Adding 3-D

In the finishing stage, the tremendous capabilities of the *VU-3D* package become apparent. One option is to remove the hidden lines from your drawing, those that the viewer normally could not see from his particular vantage point (see p. 189, Feb. '84 for an excellent tutorial on hidden lines). Once done, you can go one step further and shade the figure by choosing the direction from which the light source will strike the object. This function can be repeated using different inputs until the desired effect is achieved. One shortcoming of this feature is that even if there is more than one object displayed on the screen at a time, the objects do not throw shadows on each other as you would expect them to in reality.

By pressing the various arrow keys, you can rotate the object in any direction.

Up until this point, the figure exists within the memory of the computer as a complex string of zeros and ones; if the machine is turned off, your object disappears. To save your creation for posterity, you may print out a hardcopy if you have a printer connected to the TS2068, or you may keep it on tape. Unlike the save command that can be accessed through the main menu, this option saves the current picture screen to tape, not the original figure from which the picture was created. This static screendump can be loaded back into the computer via a Basic command and used by programs of your own design.

Summary

While *VU-3D* is extremely flexible and easy to use, it isn't without its shortcomings. For one thing, there is no easy way to draw ovals, much less circles. For another, instead of using a "repeat figure" command, you must painstakingly replicate each figure if you want similar objects on the screen at the same time. Finally, when the objects number more than a few, or become too complex, the rotate command is a little bit slow. This is more of a gripe than a valid complaint—after all, how much can one expect of a $200 computer anyway?

Make no mistake about it, *VU-3D* is a program that struts the stuff of the TS2068. Aside from the hours of fun you can have simply dreaming up exotic shapes and figures, *VU-3D* proves an invaluable tool for budding artists and geometry students as well as those involved in mechanical drawing pursuits. I strongly recommend *VU-3D*; the right hemisphere of your brain will thank you.

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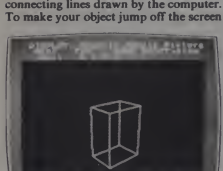

Figure 4. 3-D Perspective.

Figure 5. Hidden line removal.

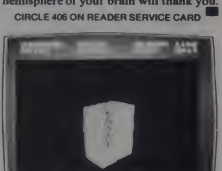

Figure 6. Color shading.

CIRCLE 111 ON READER SERVICE CARD

VU-3D for the TS2068

Back To The Drawing Board

SOFTWARE EVALUATION

Owen Linzmayer

For many in the computer world, the name Timex conjures up images of a tiny, black "toy." Timex Computer Corporation now has a larger, more expensive machine, the TS2068, and they are convinced that it is a powerful home computer. After experimenting with the hi-res graphics capabilities of *VU-3D*, a new cassette-based program for the TS2068, I must agree.

While not advertised as such, *VU-3D* can be thought of as a poor man's CAD (Computer Aided Design) package which allows the user to design, display, and print sophisticated three-dimensional "objects." Supplied on an autostart cassette, *VU-3D* was written by Psion Software and is being marketed in the U.S. by Games to Learn By.

While many software packages are touted as being user-friendly, VU-3D honestly is.

While many software packages are touted as being user-friendly, *VU-3D* honestly is—you are never more than a key-stroke or two away from a helpful menu in *VU-3D*, and a list of available commands is always present on the screen. Your first option, after loading the main program, is to enter a data file from tape or begin to create your own figure. Unless you want to recall an item previously saved to cassette, you must choose the latter, which brings you to the "drawing board."

The drawing board is where all of the cut and paste work is done. Your workspace is set up on a cartesian coordinate grid with the origin (0,0) located in the lower lefthand corner. Above the drawing board is a thin banner in which the current commands are displayed, and at the bottom of the screen is a dynamic status line with such information as the cursor position. After leafing through the sketchy seven-page pamphlet that is supplied with *VU-3D*, you are adequately prepared to "build" your first object.

Building An Object

Let's say, for example, that you want to create a rectangular box. Start off by pressing O to open the file which will contain your finished figure. A set of crosshairs pops up at the center of the screen. This is the cursor that you move around the screen using the arrow keys (5-8). After positioning the cursor where you wish to begin the base of the box, designate the starting point of the figure by pressing S.

The only thing currently on the drawing board is a single glowing point—not much to speak of yet. Slide the cursor over to the right and draw a line to that point. Move the cursor down again and draw another line. Once again to the left, and you have already drawn three sides of the box. To complete the base of the box, type E for end. This draws a line from the current position to the original starting point.

The rectangle displayed on the screen is the footprint of the object you are

SOFTWARE PROFILE

Name: VU-3D
Type: Poor man's CAD package
System: Timex/Sinclair 2068
Format: Cassette
Language: Assembly
Summary: A showcase of programming talent and computer capability.
Price: $16
Manufacturer:
Games to Learn By
P.O. Box 575
Williamsburg, MA 01096
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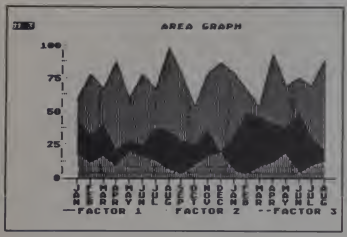
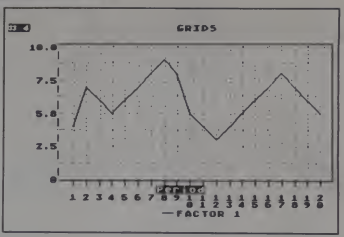
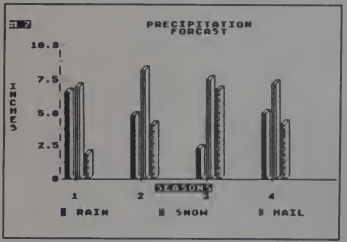
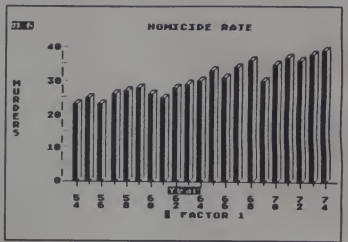








Different types of graphs can be created with B/Graph.

The scalings for the various graphs are all performed automatically by the program but can be overridden at any time. You can enhance the look of your graphs by filling in under or between lines on a line graph; adding or removing grids, borders, and labels; and changing the intensity or hue. You can even overlay one graph onto another.

B/Graph can either save your data as data files or save the graphs themselves as binary picture files. These picture files may be used with the Imaging function of the program which allows you to set up a slide show and present your graphs in sequence.

During your graphing session with *B/Graph*, the most commonly used DOS functions are readily available. You can get directory listings, lock and unlock files, rename and delete files, and even format a disk. Having these DOS functions right at hand is a convenient and thoughtful addition to the product.

On the right side of the *B/Graph* balance sheet are ease of use, comprehensive set of features, and thorough documentation. On the left side are a few minor annoyances. Printer codes cannot be passed to your printer for such things as enhanced or double-strike printing. When printing pie charts on my Epson FX-80 printer, I get footballs instead of pies. The horizontal axis is longer than the vertical axis due to the better horizontal resolution of the printer. Other printers supported by the package, however, do not exhibit this anomaly.

There are two aspects of the documentation that initially got my dander up. One is the page numbering. It is not sequential from the beginning of the book but, rather, is sequential within each chapter. It is confusing to flip back and forth between sections. The other severe deficit in the manual is the lack of an index. Fortunately, *B/Graph* is so easy to use, I rarely needed to look anything up. I also understand that both of these problems have been remedied in a new manual.

Since January 1984, *B/Graph* is no longer sold by In-Home Software. Commodore has purchased the rights to distribute and market the product for the Commodore 64, Apple, and Atari computers. Commodore will sell an entirely new version of the program with new documentation.

By the time you read this, an enhancement disk should be available to all registered owners of *B/Graph*. This will provide plotter support to the program. Inexpensive plotters such as the Mannesman Tally Pixie, the Sweet Pea, and the Atari 1020 color printer will all work.

Additional plotting functions will also be supplied. Horizontal bar charts, opposed bar charts, bubble charts, and full x-y plotting will be available. Two new statistical functions—analysis of variance and full multiple regression with six independent levels—round out the enhancement disk.

B/Graph is a powerful graphics charting program that allows you to enter data, perform an assortment of statistical manipulations, and make several types of useful and informative charts and graphs. One of the best features of the package is its interactive nature. Being able to perform a statistical test and then immediately display the results graphically really aids comprehension.

B/Graph is extremely easy to use, has an excellent reference manual, and represents an outstanding value. Michael Reichmann, Robert Wilson, and Ian Chadwick deserve a round of applause. ■

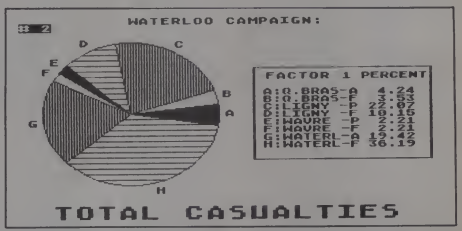
CIRCLE 405 ON READER SERVICE CARD

Business Graphics for Home Computers

B/Graph

SOFTWARE EVALUATION

Arthur Leyenberger



Apple and IBM owners are not the only ones who can create sophisticated business graphics with their computers. With the introduction of *B/Graph*, Atari and Commodore users (as well as Apple users) can easily produce bar, scatter, and pie charts. In addition to creating numerous types of graphs and charts, you can also use the analytical tools in the package for the statistical evaluation of data. Analyses such as regression, T-Test, F-Test, Chi-Square Test, and a variety of distribution functions can be performed.

If statistical functions and graphics charting were all that *B/Graph* offered, it would be a tremendous value. But there is more. Included in the excellent manual is one of the best plain-language brief tutorials on statistics I have ever seen. The information presented stresses the practical uses of the various tests and routines, so you do not have to be a statistician to use them. If I had only had access to material like this in my college Stat classes.

Also included are several appendices discussing such topics as artifacting, disk file descriptions, and even a step by step guide to photographing your video screen. All of the information is accurate and much appreciated.

B/Graph is so easy to use, I created a pie chart within 10 minutes of opening the package without referring to the manual. The program uses a combination of menus and single-key commands to create the graphs and manipulate the data. The graphs are displayed in four-color high-resolution mode using artifacting to produce crisp detail and sharp color.

The program walks you through the creation of the graph. First you select the type of graph you want. Then you choose labels and enter the data. The graph is automatically drawn. Data can easily be changed using familiar editing commands, and the graph is instantly redrawn with changes incorporated. If at any time you decide that the type of graph currently displayed is not the most appropriate for your data, you can easily switch to another type without losing your data or having to retype it. *B/Graph* will even read *VisiCalc DIF* format files, so you can pull in data from your spreadsheet files for plotting.

You can dump your graph or data to your printer whenever you wish. Printing is as simple as pressing the START key on the Atari. You choose what you want to print (graph or data) by toggling between the two screens with the SELECT key. What you see is what you get. *B/Graph* supports the following printers: Centronics, Epson with Graftrax, C. Itoh, N.E.C., Okidata 92, Gemini, and Seikosha AT/100.

SOFTWARE PROFILE

Name: B/Graph

Type: Graphics charting and statistical analysis program

System: 48K Atari, Commodore 64, Apple

Format: Disk

Summary: An excellent business graphics program. One of the best Atari software values.

Price: $99.95

Manufacturer:
Commodore Business Machines
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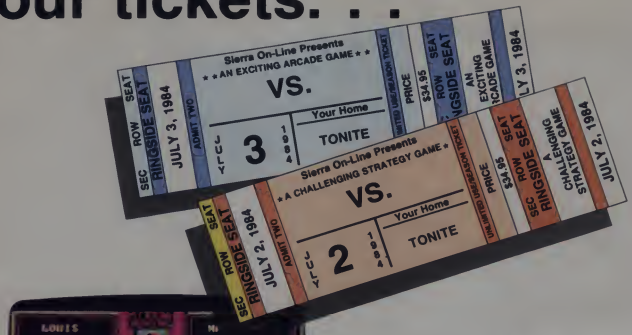

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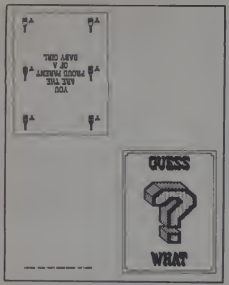


On a single pass the Print Shop positions graphics and text for greeting cards so you need only fold them as they emerge from the printer.

hi-res graphics screen created with the graphics programs. It includes a kaleidoscope generator that can be used to create unique and interesting backgrounds for your artwork.

Printing, too, is a simple matter of making menu selections, although the actual printing process can be quite slow. It can take several minutes to print a single page, but when it takes only a few minutes to create the item to be printed in the first place, you can hardly quibble about time lost during printing.

Since we had a preliminary copy of the program, we did not have the final documentation, but it is safe to say that no matter how good or how bad it may be, it will be superfluous. The program is completely self-documenting; if you can turn your Apple on, you can turn it into a print shop.

Included in the final package will be samples of brightly colored pin feed paper and matching envelopes that can be purchased from independent suppliers.

If you can turn your Apple on, you can turn it into a print shop.

The Print Shop is one of the most unusual and useful programs I have seen in a long time. It is the epitome of user-friendliness and should go a long way toward lessening the envy that Apple II owners may feel toward their Mac-owning friends. ■

CIRCLE 404 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: The Print Shop

Authors: David Balsam and Martin Kahn

Type: Graphics

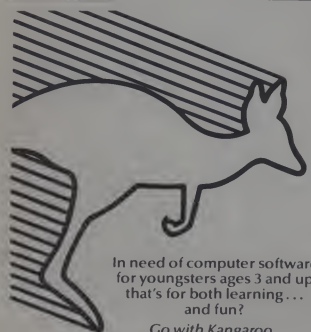
System: Apple II

Format: Disk

Summary: Useful, fun to use program for making signs, greeting cards, banners, etc.

Price: $49.95

Manufacturer:
Broderbund Software
17 Paul Dr.
San Rafael, CA 94903
(415) 479-1170



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At Last, a Graphics Program Even an Editor Can Use

SOFTWARE EVALUATION

Betsy Staples

I usually feel uncomfortable with issues of *Creative* that deal with graphics, for I am a truly uncreative person when it comes to the graphic arts. I was somewhat creative and exhibited a fair amount of artistic inclination up until the time I was about eight years old. There my artistic development was arrested; I still have the artistic abilities of an eight-year-old.

When faced with an exciting new graphics program, graphics tablet, or even the Macintosh, I freeze. If pushed by onlookers who assure me that anyone can create with this gadget, I can usually muster a perfunctory squiggle or two before sliding off the chair and attempting to vanish in the nearest crowd.

The problem is simply that I cannot think of anything to create, even given the wherewithal (as with the Mac) to create almost anything imaginable.

Imagine my joy, then, when I saw a demonstration of *The Print Shop* from Broderbund. A few seconds into the demo, I knew this program was for me—and others of my ilk. I could hardly wait to get my disk drive around a copy.

When my copy arrived, I was not disappointed; I created things—cards, signs, letterhead, all kinds of artistic, clever things.

The program is entirely menu-driven. All you have to do is choose the elements you want in your masterpiece, and *The Print Shop* does the rest.

From the opening menu, you first choose Setup to tell the program what sort of printer and interface you are using. The printers supported are Epson, C. Itoh (Prowriter), NEC 8023A, Apple Dot Matrix, Apple Imagewriter, and Star Gemini.

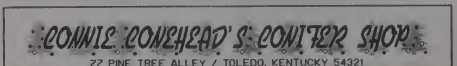
As you begin to create in earnest, you work your way through the menus, using the keyboard, a joystick, or a Koalapad to make your selections. First, you specify whether you want to create a greeting card, letterhead, sign, or banner. Then you choose one of the nine border designs. For the background of your creation, you can have either an overall pattern made up of one of the ten abstract "tiles" or a scattering of one of the dozens of pictures (train, teddy bear, champagne bottle, disk, computer, heart, etc., etc.) and symbols that are available in various sizes.

Since you probably want to communicate something verbally with your masterpiece, you must also choose one of the eight typestyles that can be printed in three sizes and in solid, outline, and three-dimensional format. You then type your message, specifying whether you want it centered or right or left justified. The message is artfully reproduced complete with sophisticated kerning or proportional spacing which enables small letters to snuggle up to their taller and wider brothers and sisters. Typing errors are easily corrected right on the screen.

An 8½ x 11" sign.

For those who feel compelled to personalize their cards and signs even further, there is a graphic editor that allows you to create your own graphics or modify those that come with the program. The KoalaPad is particularly useful in this mode.

The Screen Magic option is a screen dump utility that allows you to print any



One of many ways to set up a letterhead.

[WHAT IF IT JUST PAID FOR ITSELF?]

CAN A COMPUTER MAKE YOU RICH?

A few years ago, they said home computers would take care of your personal finances.

They would give you faultless advice on when to buy and when to sell. The implication was, they would make you rich. But until now, they did just the opposite.

There are more than 101 questions Financial Cookbook helps you answer. This is a peek at just one of them.

We're about to change all that with a program called *Financial Cookbook*. It's the first home computer program actually designed to save people money.

And while *Financial Cookbook* alone will not make you wealthy, we think it will do more in that direction, for more people, than any other home computer program to date.

One reason for this is that *Financial Cookbook* is easy to use. It combines the computing power of a pre-programmed spreadsheet with the simplicity of a basic calculator.

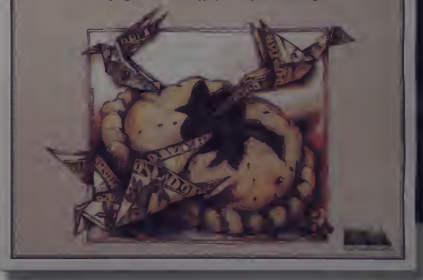
Home management software from Electronic Arts:

Financial Cookbook.

The calculator that does all the work.

by Stan Trost and Electronic Arts

Money is slippery. There are problems like interest that gets compounded daily for 20 years and then eroded every second by inflation. That problem, and more than 30 others, is what *Financial Cookbook* comes to terms with. All that its recipes require of you are a few easy ingredients: numbers. You plug them in and the computer delivers answers. The entire play-by-play on the 20 years of your account. Money begins to seem less slippery. You may even start liking it.



But more important are the ways *Financial Cookbook* can show you how to save money. Like how to make thousands of dollars by borrowing to start an IRA. How to pay off your home mortgage 10 years sooner with half the interest charge, by paying only $100 more a month. How to get $20,000 more retirement income from a $2,000 investment. And many, many more questions—on subjects from alimony to tax shelters—that we don't have the space to list here.

We do, however, have a revealing booklet called *101 Easy Ways to Save Money With Financial Cookbook*. If you call (415) 572-ARTS, we'll send you a free copy. Or you can stop by your Electronic Arts dealer and pick up a copy. The booklet of course, just lists the questions. To get the answers, we think it's only fair to ask you to buy *Financial Cookbook* itself.

We can't promise it will make you rich. But we're pretty sure that for $50* it will pay for itself in record time, and maybe even pay off that promise you invested in called a computer.

ELECTRONIC ARTS™

FINANCIAL COOKBOOK IS A FEATURED PRODUCT ON THE NEW APPLE IIc and will work with Apple II, II+, and IIe computers (with or without mouse), the IBM PC and PCjr, Commodore 64, Atari home computers and all Apple and IBM PC 100% compatibles. Apple is a registered trademark of Apple Computer Inc. IBM is a registered trademark of International Business Machines Inc. Commodore is a registered trademark of Commodore Business Machines Inc. Atari is a registered trademark of Atari Computer, a subsidiary of Warner Communications Inc.

*Suggested Retail Price

WE'LL MAKE YOUR APPLE* GROW

MEGABIG!

The Infax 101A subsystem can add 10 megabytes of storage capacity to your Apple,* Apple II, Apple III. Coming soon Macintosh and Lisa!

That's megabig! The Infax removable disk cartridge subsystems provide performance, capacity, speed and convenience. Engineered specifically for the Apple* owner, this system has a removable disk cartridge that is equal in capacity to 69 floppy disks. Contained in a newly designed cabinet, the Infax 101A features state-of-the-art engineering that makes it more resistant to shock and vibration than any other fixed or removable disk drive. With its proven high performance Infax brings the Apple* owner a removable disk cartridge subsystem that is second to none.

The Infax removable disk cartridge is the ultimate convenience.

Only a little more than 8 by 10 inches in size, the disk cartridge easily slides in and out of the 101A and 102A. A specially designed electronic locking system protects an operating environment that is both efficient and fail-safe. In fact, both Infax systems offer the fastest start/stop (cartridge replacement) of any high performance disk drive.

Introducing the Infax 102A . . . it's megabigger and designed for the up-scale Apple* owner.

Imagine 20 megabytes of storage capacity in a cabinet barely larger than an electronic typewriter. Containing 2 disk drives, the Infax 102A features all of the engineering technology of the 101A and more. Lightweight, this removable disk cartridge subsystem provides the same capacity of many less portable mainframe computers and at a fraction of the cost

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menu chaining routine I wrote for one PC wouldn't work on another PC, I gave up, expecting that I would have to start over from the beginning. Instead, I found that it took me less than 30 minutes to convert a program written in IBM Pascal to Turbo Pascal.

Short programs that had taken four minutes to compile now compiled in 10 seconds. Longer programs that had taken 20 minutes to compile now took less than a minute. And a program that I had to compile in four pieces under IBM Pascal compiled in one piece!

I have been working on a series of 60 programs; under IBM Pascal, the average program took two weeks to write. With Turbo Pascal, the average is now two days. And program chaining, so necessary for turnkey applications, worked the first time I tried it.

Limitations

To date, I have found only two significant limitations to Turbo Pascal. First, it creates only COM files, while IBM Pascal creates EXE files. The difference is that COM files always load into the same area of memory, while EXE files are relocatable. It is possible with IBM Pascal to have several programs in memory and switch between them without disk access. Aborting a program called from a menu program returns you automatically to the menu. The same is not true of Turbo Pascal.

The second limitation is that Turbo Pascal limits you to 64K of program and 64K of data in each program, while MS-DOS allows much larger programs if you have either a hard disk or the patience to compile dozens of modules and units.

Turbo Pascal follows the Jensen and Wirth standard for Pascal closely, with only a few justifiable omissions. Mark and Release are used with pointer variables instead of Dispose. Read and Write have been extended to handle all I/O needs, eliminating the need for Get and Put, which are not implemented. Goto statements are limited to the current block, but no self-respecting Pascal programmer uses Goto, anyway. Page, Pack, and Unpack are not implemented; all are minor functions.

Enhancements

There are many enhancements to the Pascal standard in Turbo Pascal, including a set of string functions, random file handling, screen control, DOS primitives, random number generation, and memory management functions. The built-in procedure MsDos allows direct access to DOS, with a set of dependent functions and procedures and control over all registers. The procedure InLine allows machine code to be embedded in your program, with other features such as optional absolute addressing and predefined types Addr, Ofs, Seg, CSeg, DSeg, SSeg, Byte, Mem, MemW, Port, PortW, and Word for direct machine control. You can also link to external subprograms.

```
Here is a direct translation of Dave Ahl's Basic benchmark:

program Ahl1SimpleBenchmark;
var n, i : integer;
    a,r,s : real;
begin
  a := 0.0; r := a; s := a;
  for n := 1 to 100 do
    begin
      a := n;
      for i := 1 to 10 do
        begin
          a := sqrt(a);
          r := r + random
        end;
      for i := 1 to 10 do
        begin
          a := sqr(a);
          r := r + random
        end;
      s := s + a
    end;
  writeln(abs(1010 - s/5));
  writeln(abs(1000 - r)
end;

Turbo Pascal Benchmark results on an IBM PC jr:

Time     Accuracy              Random
0:59  0.0000000000E+00  1.5178304262E+01
```

Turbo Pascal comes with a built-in editor, which is very similar to *WordStar*, with 38 commands. You can also set up a keyboard translation table, so I changed my keys to match the functions of *Perfect Writer*, which I use to write programs. I use the built-in editor only for minor changes to programs, since I prefer the dual windows, text movement, and search functions in *Perfect Writer*. If you compile from memory and encounter an error, either during compilation or at run time, Turbo Pascal automatically locates the line in which the error occurred, and after printing an error message, puts you in the editor at that location.

Usually I program with *Perfect Writer* in my Seequa Chameleon and Turbo Pascal in my IBM PCjr. The monitor for the PCjr sits on top of the Chameleon. I save the program to a DOS 2.1 disk (one key stroke), put the disk in the jr, and execute it (two more keystrokes). That way I can adjust the graphics or fix bugs while watching the program on one screen and editing it on another.

Turbo Pascal is lacking in graphics functions, probably to keep one manual compatible with various Z80 CP/M, CP/M 86, and MS-DOS machines. I use a set of procedures developed by Richard Koch that add the ability to set graphics modes; set, reset, and test points on the screen; and draw lines and circles on the IBM and compatible computers. (I have Dick's permission to send a printout of the routines to readers of this article for $2 and a self-addressed envelope.)

Documentation

Turbo Pascal comes with a 250-page perfect bound instruction book that is of above average readability for a technical manual. (I can recognize English, French, Greek, Hebrew, Italian, Japanese, Thai, Spanish, Latin, Arabic, Coptic, German and Russian, but I still haven't figured out what language IBM uses in their Pascal manual.)

Many explanations are cursory, and examples are too few and too limited, especially for functions unique to Turbo Pascal. The manual also contains several typographical and a few factual errors. I was able to obtain some limited and only partially accurate technical help by calling Borland International. Microsoft's tech support was better; IBM's far worse!

Borland recently eliminated my only other complaint about the package by dropping the $100 license fee it previously charged users of Turbo Pascal for reselling programs written with it. The $50 purchase price now includes unlimited rights to write programs using the compiler and sell those programs in the commercial market.

My only fear for the program is that at $50, it is grossly underpriced, and I worry that people might fail to take it seriously. That would be a shame, for this is a terrific package, whether for learning Pascal or for software development. ■

CIRCLE 403 ON READER SERVICE CARD

The Best Costs Less

SOFTWARE EVALUATION

George Blank

Turbo Pascal

For years, programmers have been arguing the relative merits of different computer languages. They often miss the point. The language may not be as important as the implementation. Consider the relative merits of two cars: a Rolls Royce might be a better car than a Ford, but I would prefer a new Ford to a Rolls that just had a head-on collision with a train.

Theoretically, Pascal is a language far superior to Basic. To quote Edsger Dijkstra, "It is nearly impossible to teach programming to anyone with a prior exposure to Basic." Learning Basic as a first language practically guarantees that a programmer will develop bad habits, including spaghetti coding, cut and try programming, inadequate internal documentation, abuse of global variables, and a failure to avoid side effects.

Problems With Other Pascals

Until recently, the Basic vs. Pascal controversy was irrelevant to IBM PC users. The computer has a powerful, full featured Basic, while the first three versions of Pascal I obtained for the PC all had serious flaws. Pascal MT+ at that time worked only under CP/M. UCSD Pascal demanded exorbitant fees from programmers who wanted to sell programs written under the system, which was also slow, clumsy, and not very accurate. IBM or Microsoft Pascal lacked the most fundamental extensions for serious programming: program chaining, cursor control, and screen handling functions. Despite these inadequacies, all three charged $300 and up for their mediocre versions of Pascal.

Of the three, IBM Pascal seemed the best choice. So I spent weeks developing routines for cursor and screen control. I paid $100 for a routine to allow program chaining, only to have the program fail if I tried to use it in a different machine. Even after I developed a batch file to speed up the compilation process and reduce the typing necessary to name 12 intermediate files generated by the compiler, I tolerated four minutes of disk swapping to compile even the smallest program.

The intermediate code was so grossly inefficient that my 360K disk drives were inadequate for moderate size programs. I had to break the programs down into smaller units and compile them separately. After one year of using the system, I still could not produce a reliable turnkey package.

Then I saw an advertisement for Turbo Pascal. The ad promised everything I needed at the ridiculous price of $50.

The ad promised everything I needed at the ridiculous price of $50.

Built-in functions included ClrScr to clear screen and GotoXY to position the cursor. Program chaining was supported, with compiler options allowing the creation of either COM files or chain modules that used less memory. It was even possible, the literature promised, to compile and run a program directly from memory. I sent for the program.

I had so much time, effort, and money tied up in the IBM Pascal version of my programs that I avoided switching over for three weeks. But when I found that a

SOFTWARE PROFILE

Name: Turbo Pascal
Type: Language (compiler)
System: IBM PC, PCjr, MS-DOS, CP/M-86, CP/M
Format: Disk
Language: Machine
Summary: Outstanding value
Price: $50
Manufacturer:
Borland International
4807 Scotts Valley Dr.
Scotts Valley, CA 95066

string of complex DOS commands into a batch file and execute them whenever you want simply by selecting that file from the menu. And in case part of your organizational problems stem from not always remembering just how things are organized, you can use Fixed Disk Organizer to establish Help files as a reminder.

So we're all in trouble—no more excuses for not being organized.

Moving Pictures and Mathematical Castles. Let's not forget that there's more to life than programming, compiling, and getting organized. There's also software from IBM for pure enjoyment and for enjoyable education. Two such packages are Animation Creation and Adventures in Math.

Adventures in Math incorporates math drills into an adventure game with vivid color graphics of a castle and its passageways and treasures. To find the way out—and to uncover as many treasures as possible along the way—children (or particularly skillful adults) have to solve basic math problems. The program's difficulty level increases as you solve the problems you're confronted with.

Using Animation Creation, you or your children can draw your own pictures and watch them come to life. To draw pictures, you select from 254 computer characters and position them on your screen. Add color by choosing any of 16 foreground and 8 background colors. Then, by slightly repositioning the images on successive screens, you can create animation.

Next stop, Hollywood.

HARDCOPY

You Can't Enjoy the Game without a Program. Earlier in this issue (see "On the Storefront"), we discussed the Customer Support System for online information about IBM Personal Computer products. Much of that information is also available in two publications: *The Guide*, a directory of Personal Computer offerings from IBM, and *The Library*, a directory of IBM Personal Computer software offerings. If you want to enjoy the personal computer game, these are the "programs" you need to do it.

The Guide, published twice a year, is a catalog that contains clear, concise descriptions of IBM PC, IBM PC XT, IBM PCjr, and IBM *Portable* PC systems. It also reviews printers, video displays, expansion units, and all other IBM PC hardware products. A separate section of *The Guide* contains articles on IBM PC software packages.

Both hardware and software articles are illustrated

with annotated color photographs—of key screens for the software packages—and start with charts that provide quick product overviews. Other noteworthy features include sample configuration tables for all three systems and a closing section on Sales and Service Support.

The Library, updated quarterly, presents an overview in booklet form of the entire IBM PC software product line. It presents the software by category, with sections on Operating Systems and Languages, Personal Productivity, Communications, Business, Education, and Entertainment. Program descriptions are brief and to the point. Each includes a short overview, program highlights, and system requirements. There's also a chart at the end of the booklet that shows at a glance which programs are compatible with the IBM PCjr.

Or the Hardware without a Manual. If *The Guide* and *The Library* are the general road maps to IBM PC products, the *Technical Reference* and *Hardware Maintenance and Service* manuals*—now available in newly updated versions—are the detailed maps of downtown. It's not a trip everyone wants to take, but if you do, these are the right directions.

There's a three-volume *Technical Reference* set for the PC and another for the PC XT and *Portable* PC. These manuals include the functional specifications for the system units and for the options and adaptors in the IBM PC product line. The *Hardware Maintenance and Service* manual details many aspects of troubleshooting a personal computer from IBM. It includes a parts catalog, a section on preventive maintenance, and instructions for identifying the failure of a replacement unit.

*These manuals are intended for use by technically qualified service personnel.

TIPS AND TECHNIQUES

If you use Personal Editor—IBM's full-screen editor for writing programs and brief documents—but find yourself displaying the Help file whenever you forget a function key assignment, here's a little help from the fellow forgetful.

Function key assignments can easily be displayed on the command line of your Personal Editor screen by assigning F1 to display the unmodified keys and alt+F1 to display the alt+Fx keys. You can then assign the Help function to alt+H, although you probably won't need it nearly as often as before.

The macro for the F1 assignment can be written as follows: def f1 = [cursor command] [begin line] 'F: 2=Save 3=File 4=Quit 5=Erase 6=EraseEOL 7=Print 8=Switch 9=Insl. 10=Ins&Indt' [cursor data].

IBM

For more information about IBM Personal Computer products, see your authorized IBM Personal Computer dealer or IBM Product Center. To learn where, call 800-447-4700. In Alaska and Hawaii, 800-447-0890.

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Little Tramp character licensed by Bubbles Inc', s.a.

WHAT'S THE PROGRAM

We Speak Your Language. IBM Personal Computers are shameless polyglots. They can handle most of the popular programming languages you want to work with. Much of the credit for their versatility goes to the IBM Disk Operating System (DOS) 2.10. This updated version of DOS 2.00 was developed to provide support for the IBM PCjr as well as for the IBM PC, PC XT, and IBM *Portable* PC. So all members of the IBM Personal Computer family are united by a single master program that provides the required support between their hardware and a wide range of application programs.

More to our present linguistic point, the DOS 2.10 diskette contains two programs, Disk BASIC and Advanced BASIC, to help you write your own programs on an IBM PC. (IBM PCjr BASIC—a separate, optional cartridge—provides this support for the PCjr.) Disk BASIC adds DOS file support, date, time of day, and communications capabilities to the BASIC language that comes with every personal computer from IBM. Advanced BASIC adds advanced key trapping and advanced graphics—including viewports, windows, and paint tiling—plus music and other capabilities.

DOS has other features that help simplify advanced program development and design, including a line editor, a linker, background printing, and chaining of commands. For help with writing and editing particularly sophisticated BASIC programs, there's the BASIC Programming Development System, a software package that consists of two programs and four utilities. The first program includes a Text File Editor and a Structured BASIC Pre-processor; the second includes a BASIC Formatter and a BASIC Cross-Reference.

Native Translators Available. The IBM BASIC Compiler compiles or translates the BASIC programs you've written, down to native object code so they'll run on your IBM PC. And BASIC is just the beginning. DOS also provides the support you need to develop and run programs using the IBM Personal Computer Macro Assembler or the FORTRAN, COBOL, and Pascal Compilers.*

Two of these, the FORTRAN and Pascal Compilers, are available in recently updated versions. IBM PC Pascal 2.0 is based on the ISO standard, and IBM PC FORTRAN 2.0 conforms to the ANSI-77 standard subset level. Both new versions feature improved arithmetic capabilities, and both support the IBM 8087 Math Co-processor for greatly increased speed in processing floating point calculations. (For more about the Math Co-processor, see "Hardware News" in this issue of *Read Only*.)

In addition, versions 2.0 of the FORTRAN and Pascal Compilers feature a Library Manager for creating user-defined libraries and provide easy access to all files in any subdirectory through DOS path support. FORTRAN 2.0 supports linking of object modules with subroutines written in Pascal 2.0 and vice versa. Both new versions support linking of object modules with subroutines written in IBM PC Macro Assembler.

There's a bargain in store for those who already own the 1.0 versions of these compilers: you have the option of buying an upgrade to the 2.0 version at a substantial savings from the full 2.0 price.

To ensure that your programming reach doesn't exceed your grasp, the IBM PC APL Interpreter enables you to write and edit your own programs in APL. It can also be used to exchange data files and workspace between your IBM PC and many mainframe computers.*

Finally, if you're inclined to make serious use of the IBM PC's array of programming aids, we suggest that you also take a look at the recently announced IBM PC Sort program. It provides support for data types and file organizations used by the IBM DOS-supported languages mentioned

Application development tools from IBM

above and can significantly speed and streamline your programming efforts.

IBM PC Sort can be used as a stand-alone utility, integrated into a batch job stream, or invoked directly from a COBOL program via the Sort verb. It can sort records from a data file or files, merge multiple input files, selectively include or exclude records, and create an output file containing the records, pointers, or keys from the input files. There are no arbitrary limits in IBM PC Sort for file size, record length, number of keys, or number of input files.

*BASIC Compiler and Macro Assembler will run on the IBM PCjr. APL Interpreter will not. Although the IBM PCjr does not support FORTRAN, COBOL, and Pascal Compilers, most of their output will run on the PCjr if there is sufficient storage.

Now Get Organized. The IBM PC's ability to run a wide variety of commercially available programs and to help you develop your own applications may result in a good news/bad news situation. The good news is that you'll be able to satisfy your application requirements. The bad news is that you'll probably be the one responsible for keeping track of your growing library of programs. If, as we've often found, enthusiasm outstrips organization, you may find yourself falling behind—especially if you're working in an area, such as

Animation Creation software from IBM

small business finance or education, where programs multiply rapidly.

Fortunately, help is in sight, in the form of Fixed Disk Organizer, an IBM software package that does just what its name suggests.

Fixed Disk Organizer has a master menu that lets you sort out your various application programs by category—word processing, spreadsheet, communications, and so on. You can tailor the menu to your specific application needs by adding new menu categories, revising or deleting existing categories, or changing titles. The master menu allows you to review all the programs stored on your fixed disk at a glance and to call them up quickly with just a couple of keystrokes.

Fixed Disk Organizer also helps protect sensitive data by allowing you to create passwords and restrict access. It also enables you to write a

Information from CSS with simple one-key commands

product demonstration you want. If you know a product name to begin with—Word Proof, for example—CSS will make an alphabetic search for it. To keep you up-to-date, there's also a special listing for new product announcements.

You can browse through the CSS displays at your own pace, pausing at a given spot or moving quickly backward or forward by using simple one-key commands that are always displayed at the bottom of the screen. One of these commands enables you to make print-outs of any information you wish to save for future reference.

The IBM PC family's color graphics capabilities make the CSS software demonstrations especially impressive. The Multiplan demonstration, for example, consists of several consecutive screens of information. Each screen is split vertically, with representative sections of the actual program on the left and explanatory text on the right. By the time you've seen the entire demonstration, you'll have a good idea of both *what* the program can do for you and *how* it does it.

Answers at the End of the Line. Over 1,000 authorized IBM retail dealers and IBM Product Centers are linked through their Customer Support System to the IBM Information Network. This nationwide communications capability helps your dealer give you fast, efficient service. Warranty claims, for instance, can be handled through CSS with a minimum of paperwork and delay. Dealers also use the network to communicate with other dealers and with IBM to keep abreast of the latest product and service information.

In addition, the CSS network is your gateway to technical information about the IBM Personal Computer family of products. IBM maintains a database on a 3033 mainframe in Tampa, Florida, that your dealer can use to answer—within minutes—a wide range of questions. If the solution isn't on hand in the database, your question can be submitted through CSS to a technical support staff in Boca Raton. There, it will be analyzed and an answer returned through CSS to your dealer.

The information used to answer your inquiry is added to the CSS database, where it will be immediately available for anyone else with a similar question. Your technical inquiries therefore contribute to the growth of the Customer Support System. Its online product information, color graphics displays, and advanced communications all have a single purpose—to help you get the most out of your investment in IBM Personal Computer hardware and software products.

HARDWARE NEWS

Color. There's color news for the IBM PC, IBM PC XT, and IBM *Portable* PC in the form of the IBM Personal Computer Color Printer. It's a high-performance, dot matrix printer that can print charts, graphics, artwork, and text in up to eight colors. The Color Printer produces color graphics that can enhance the appearance of your reports and presentations and make the information they contain even easier to understand. It can also type directly onto overhead transparencies.

The IBM PC Color Printer's range of performance features make it especially well suited for heavy-use/high-productivity applications. A near letter quality printing mode is standard. Printing speeds of up to 200 characters per second can help save time. So can programmable automatic control of print requirements such as print mode, line spacing, and margin and tab setting. These programmable features act as an extension of many software products—word processing programs, for instance—and can be initiated with just a few keystrokes.

A final feature for those who like a personal touch. You can use the Color Printer to personalize your documents by varying the printing modes, character spacing, and boldness. This allows you to differentiate

The IBM PC Color Printer

among headlines, subheads, and quotations and even to print math and science equations.

The Big Crunch. Not long ago, computing and number crunching were nearly synonymous. Personal computers and software for everything from office management to agriculture changed that, but the need for heavy number crunching has hardly disappeared. If it's still a part of your computer workload, the IBM Personal Computer 8087 Math Co-processor can help speed up your calculations.

The 8087 is a floating point co-processor that multiplies, divides, adds, subtracts, exponentiates, and performs trigonometric and logarithmic functions. It works together with the PC's 8088 processor to improve the execution speed of floating point operations by as much as 10:1. The Math Co-processor increases calculation speeds so greatly because it makes floating point operations a hardware rather than a software function.

In addition to increasing the speed—and often the level of precision—of statistical and analytical math packages, the Math Co-processor can improve the display speed of graphics and video games. It also significantly improves high-level language execution time, and is designed to work with the APL Interpreter and the version 2.0 Pascal and FORTRAN Compilers discussed next in this issue.

READ ONLY

A review of the IBM Personal Computer family: Summer 1984

UP AND RUNNING

And Swimming, Building, and Baking. Building and baking? They don't produce gold medal winners, but they do figure in staging the Olympic games. So do 200 IBM Personal Computers (including software) that are part of IBM's sponsorship of the 1984 Olympics in Los Angeles. In fact, IBM PCs are hard at work in both sports and administration.

PCs are involved in a wide range of planning and analytical activities, though they don't provide official results of the various athletic events. Some events, for example, use the IBM PC to determine how competitors are seeded—who competes against whom. In other events, such as archery, the PC simplifies the complex task of recording scores and compiling statistics for each athlete as the competition progresses.

In events like gymnastics that depend on points awarded by judges, statistics can be kept on the PCs to analyze scoring consistency. Also, a whole range of information about individual athletes, past Olympics, and world and national records, both past and present, can be quickly recalled and compared with the help of the IBM PC.

Last but not least, administration. Spreadsheet programs, such as IBM's Multiplan™, were used on the PC for planning and forecasting by nearly every administrative department, from Construction to Ticketing. The same departments speed up some of their day-to-day accounting tasks with the help of the PC and IBM accounting packages.

Departments with specific software needs developed special packages with the assistance of a programmer whose services are part of IBM's Olympic sponsorship. Specially designed programs include database management applications to help handle transportation requirements and inventory control programs to keep track of sports equipment and personnel records.

In short, there's hardly an area of planning and staging the 1984 Summer Olympics that the IBM Personal Computer doesn't play a part in. Maybe there *should* be medals for administration.

Multiplan is a U.S. trademark of Microsoft Corporation.

ON THE STOREFRONT

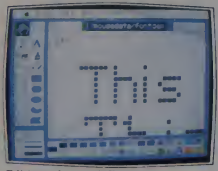
A Shorter Distance between PC Points. We're all familiar with the feeling of being lost in the growing maze of new computer products. IBM has opened a path through that maze, straight to the information and answers you need about IBM Personal Computer Products—information about a specific software package or hardware configuration and answers to technical questions.

The key to entering this new information path is the IBM Customer Support System (CSS) at your authorized IBM Personal Computer retail dealer or IBM Product Center. Dealers in over 300 cities throughout all 50 states use the Customer Support Sys-

tem, which includes a nationwide communications network, to help give you instantaneous computer-age service support that's unmatched by any other computer manufacturer.

Colorful Stops along the Way. More than 1,700 authorized IBM dealers have access to a permanent and continually updated directory of IBM Personal Computer product information in IBM's Customer Support System. For a sharp color display of the type and level of information you want, visit your dealer or IBM Product Center and choose from lists of options displayed on an IBM PC color monitor. There are choices that guide you quickly and easily from product directories to in-depth product demonstrations and configuration information.

Since knowing how to take the first step is often a problem, CSS gives you a variety of possible starting points. By selecting the appropriate category—such as printers or business software—you can move to a list of specific products and then to the



Editing a font with FatBits.

Colors and patterns are selected from the bar at the bottom of the screen. Move the pointer over your selection and click the mouse to select one.

The editor box can be dragged or "rubber banded" across the screen, letting you copy, invert, flip, or cut and paste graphics. Cut text is moved into a buffer and can be placed anywhere in the picture you are working on or onto another picture.

"Rubber banding" makes the drawing of lines and shapes very easy. Click a shape icon, such as rectangle, circle, free-style, or polygon, and move the mouse back to the drawing page. Click the mouse and drag it across the screen. As it moves, the shape is continually drawn, erased, and redrawn until you are satisfied and the mouse button is clicked again. The shape is *always* true, i.e., the sides of a square are always even and in proportion. Depending on how you "rubber band," a circle might be an oval, a flat disk, or a perfect circle.

Unlike other graphics programs, the background underneath an image isn't erased or changed; it is always there. Selecting Undo from the Edit menu erases the last drawn shape and restores what was behind it.

Fatbits is a magnified mode that blows up the portion of the page occupying the upper left of the screen, allowing editing of fine details. You use the pencil icon to turn on or off different blocks in the picture.

Five fonts—Toronto, New York, Athens, Venice, and System Font—are used to place text anywhere on the screen. Select a font from the menu, click the text icon (a large letter A), and move the cursor to the point where text should begin. All keyboard characters are available, including DELETE.

MousePaint is one of the easiest and most responsive graphics packages I have used. It does have three drawbacks, however. The pencil and paintbrush icons draw only with black or white ink. Colors aren't allowed. Second, you can Undo only the last command. You can't do a series of Undo's to erase successive steps. And finally, the clipboard holds just one cut image at a time. These may be minor points to you, however. I found it both enjoyable and instructive to work around these limitations.

Windows

Like the Mac and Lisa, *MousePaint* features overlapping menus and windows. One gives information about *MousePaint*. Another lets you set the size and type of brush, and the third shows a miniature view of what the page will look like when printed on the Apple Imagewriter printer. The final window is used to select a font.

The menus follow the Mac/Lisa scheme. At the top of the screen is a bar with the names of different menus: File, Edit, Aids, and Font. Point to one, press the mouse button, and the menu slides down onto the screen. Moving the pointer to a menu option activates it. When the mouse button is released, the menu disappears.

Mouse Technicalities

The Apple II Mouse includes a 5-chip interface card with its own 6502 microprocessor and ROM routines which make the mouse a good deal more responsive than any game controller. The dedicated 6502 frees the Apple CPU for other tasks and speeds mouse operations. The Apple II Mouse may be installed in any slot, though slot 4 is recommended.

Because you use the mouse by moving it around a table top, you will need to set up a clean working area. The work space should be next to your Apple and about one foot square.

Software and Documentation

In addition to the *MousePaint* program, a short tutorial on how to move and use the mouse is included on disk. I wish that Apple had included some sample graphics, perhaps the same graphic in different stages of completion. Disk space may have been a problem, though. You can save only one picture on the *MousePaint* master. *MousePaint* files can be saved on any proDOS formatted disk, and the master is unprotected.

The documentation is a 56-page booklet that explains how to clean the mouse, what the various icons mean, hints on easier shape drawing, and how to write mouse programs. It is written in Apple's usual style—understandable, readable, and very friendly.

Survival of the Fittest

Can the Apple II Mouse make it? Is mouse technology the way the future will be, or is it just a novelty? Sure, *MousePaint* is fun to play with, but what else can you do with it?

First, the mouse works. It is responsive, fast, and transparent—i.e., you get used to it quickly. Using the mouse with *MousePaint* makes me want to use it in conjunction with other programs, such as *AppleWorks*. That leads us to a sensitive question. Will there be software that can use the mouse?

A MousePaint drawing.

We hear that Bill Budge is at work on more software for the mouse, including a graphics toolkit and other goodies that will help make the Apple II look like a Macintosh. And we won't have to wait long for a mouse-based *Pinball Construction Set*.

Other developers are working on converting existing software for use with mice. The Electronic Arts personal productivity line will use the mouse, as will the graphics series from Penguin Software.

Not every program will benefit from mouse technology, however. Where keyboard use is vital, a mouse interface is a luxury.

Other than the conversion of existing software, what does the future hold? Are there any applications that are perfect for a mouse interface? One potentially intriguing area is in communication for the motor-impaired. One system of communication, called Bliss Symbolics, uses iconic representations of different actions and words. A hand pointer is moved across the board, and the symbols are read and interpreted by another person.

A mouse is just a pointer. With a speech synthesizer, intelligent software, and the Apple II Mouse, the disabled would be able to better communicate with the world. The software could collect the symbols and print or speak complete sentences. The relative low-cost and ease of use of an Apple II makes such a system practical.

The real test of the mouse will be on the Macintosh or the Lisa. Those systems *demand* a mouse interface. The Apple II will be the proving ground. If intelligent software is written, and if the $149 price tag isn't seen as too high, the Apple II Mouse should have a long, prosperous life. ■

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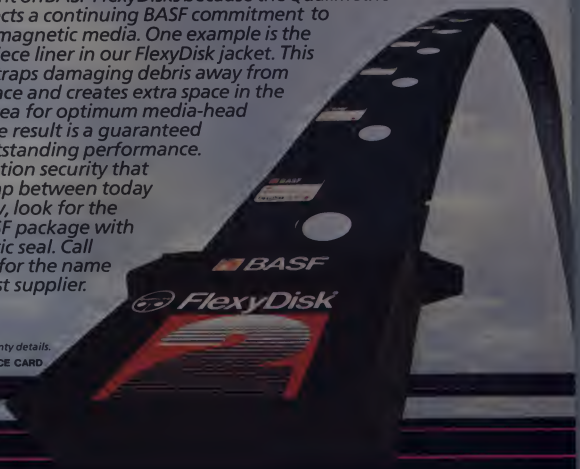

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Apple II Mouse

HARDWARE EVALUATION

Steve Arrants

Apple owners who have taken a test drive with the Lisa or Macintosh are impressed by these new machines. They are sleek, powerful, and fun. But let's face it, most of us are not going to rush out and buy these expensive and powerful machines based only on a short test. We have a large investment—in both time and money—tied up in our Apple IIs. Still, after using a Macintosh, you begin to see the usefulness of the mouse. For control of text in MacWrite, image creation and manipulation in MacPaint, and in other programs, the mouse makes many things easier to do.

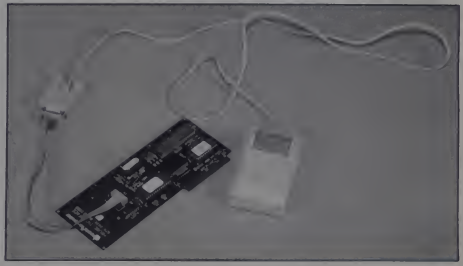
HARDWARE PROFILE

Name: The Apple II Mouse
Type: Peripheral
System: Apple II, II+, or IIe
Software: MousePaint software written by Bill Budge
Documentation: User's manual
Price: $149
Summary: More than a novelty. The Apple II Mouse might change the way we use the Apple.
Manufacturer:
Apple Computer Corp.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

Say "Cheese"

Now, there is a mouse for the Apple II series. It is the same mouse that Lisa and Mac use: a small, cigarette pack size box topped by a big grey button. On the bottom, it has a small rubberized ball held by a locking ring. When the mouse is placed on a tabletop, the ball is held against a set of motion detectors that convert your hand movements into signals that the computer can process.

As an analogy, think of a track-ball



controller on your favorite arcade game. The mouse is a more refined version of this game controller, turned upside down. Instead of using the cursor keys and a control-key squence, you use the mouse to move a pointer across the screen to an icon or verbal menu selection. Action is initiated when you depress the button.

Included in the package is *MousePaint* software written by Bill Budge, a full-featured graphics package that is as close to MacPaint as many Apple II owners will get. And it has one feature that will make Mac owners jealous—color.

Training the Mouse

The *MousePaint* software is a freehand graphics program which incorporates different tools to convert mouse movements into patterns, shapes, brush strokes, lines, and curves. To select a tool, drag the pointer to the lefthand side of the screen. Place the pointer over a tool, click the mouse, and you are ready to take action.

The hand icon is used to pull more of the page into view, since the space you see on your monitor is only part of the total sketchpad. The pencil lets you make freehand drawings on the sketchpad. The spray can helps you shade your picture. The brush paints a swath of black in different widths on-screen. A straight edge draws straight lines at any angle, in various widths and patterns. If you make a mistake, the eraser quickly wipes clean any part of your drawing.

Five pairs of shape symbols are also available: rectangle, rectangle with rounded corners, oval/circle, free-form, and polygon. You may choose an outline shape or its solid form.

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colors; add text to graphs; fill areas with various colors or patterns; and select line styles, widths, and colors.

DR Graph is furnished in either CP/M or CP/M-86 versions, and requires, for hard copy, either a plotter or dot matrix printer. The package supports a wide range of printers and plotters including units from Epson, Hewlett-Packard, Houston Instruments, DEC, Digital Engineering, ADDS, Datamedia, IDS, Okidata, Printronix, Strobe, and Televideo. The graph in Figure 2 was produced by DR Graph driving an Epson MX-80 printer with Graphtrax Plus.

We mentioned taking advantage of color in the previous section. Talk about color! If you have it, Dr Graph uses it, and uses it well. Of course, if you have a monochrome system, the high-resolution display is capable of displaying the detail on the graphs as well.

The manual is divided into four parts: a getting started tutorial, an advanced tutorial, a section on data interfacing, and a section on moving around in the menus. The data interfacing section describes how to load and use data from *VisiCalc*, *SuperCalc*, and other programs which store data in the DIF or SDI formats.

Documentation

This is the first computer we have evaluated in quite some time that did not come with a fat User's Guide or equivalent. Instead, the Decision Mate V has a 52-page introductory packet in the MS-DOS manual titled "User Information." The first two sections describe installation procedures and the elements of the system. The next tells how to get it started, and the last two sections provide helpful hints ("Discourage smoking and drinking near the computer") and a troubleshooting chart. We rate this guide adequate, but no more.

The MS-DOS User's Guide is the standard mishmash supplied by Microsoft. Actually, the MS-DOS Guide is better than most. It consists of three sections: the main basic guide, a supplement (which isn't about MS-DOS at all, but describes the CP/M applications programs), and the MS-DOS Programmer's Manual. In all, this is a formidable package and one designed to discourage all but the most courageous user.

The manuals for the MicroPro and Sorcim packages are written by the software producers and are quite competent and understandable as is the DR Graph manual from NCR. The GW Basic manual is awful, but at least a wide assortment of books on MBasic is available. Unfortunately, none of these describes the use of the graphics commands particularly well. We did not have the CP/M manual so we cannot comment on it.

Service and Support

As a major manufacturer of mainframe computers, NCR has a large field service organization in 1200 offices throughout the world. Hence, they offer a range of service options including an on-site service contract, time and material service, and depot service. Also, computer stores and system houses selling the Decision Mate V may have established their own servicing arrangements.

To aid in the service procedure, a plug-in diagnostics module is available. This may not be an economic investment for sites with just one machine, but for companies with several units, it probably makes sense to diagnose problems before the clock starts running on expensive service rep time.

For real do-it-yourselfers or for multiple systems installations, NCR offers a set of service manuals. Be warned: these are not for the casual hacker.

Local Area Network

While this is not a review of a local area network, we should mention that NCR offers a network for up to 64 stations. NCR Omninet, a version of the CP Net developed by Digital Research, requires a central input/output file manager and a storage device known as Modus. Modus maximizes system throughput by using multiple I/O processors, cache memory, and state-of-the-art data management techniques. It allows many users to share the same file on the same peripheral, provided they all have the appropriate security clearance. Modus offers three levels of system security: user I.D., password, and user number.

NCR offers Omninet, a cost-effective local area network.

Access to Omninet requires the addition of a plug-in communications module in each Decision Mate V. The module is supplied by Corvus, a leader in local area communications. Although 64 stations can be on the net, only 16 can be simultaneously operational. Omninet uses a data transmission rate of one megabit per second, one-tenth the speed of Ethernet, but it is easier to install and costs about half as much.

Pricing

The decision Mate V comes in three basic configurations, all of which have 64K of memory:

1. 8-bit mpu, monochrome display, $2650.
2. 8/16-bit, monochrome, $3090.
3. 8/16-bit, color display, $3440.

Memory, other options, and software are priced as follows:

64K to 128K upgrade	$200
64K to 256K upgrade	550
64K to 512K upgrade	1200
8 to 16-bit upgrade	500
10Mb Winchester drive	3000
Parallel interface	100
RS-232 serial interface	200
RS-232 modem interface	150
MS-DOS	50
CP/M-86	60
CP/M	150
WordStar	495
SuperCalc²	295
DR Graph	400

Our 8/16-bit test machine with 128K, color display, parallel interface, MS-DOS, CP/M-86, *WordStar*, *SuperCalc²*, and DR Graph—more or less an ideal configuration for business applications—would go for $5040, certainly no bargain, but not out of line either.

A Decision for Decision Mate V?

Should you buy a Decision Mate V? The system is solidly engineered and constructed, and shows off its German heritage. For the price, we don't think the 8-bit configuration makes much sense (you can get a Z80A machine for one-half as much). However, the 8/16-bit configuration is another story. In one machine, you have the ability to run CP/M, CP/M-86, and MS-DOS software. While NCR doesn't offer that many packages directly, they are available from dealers and third party vendors.

The graphics are stunning and second to none. Moreover, the NCR DR Graph package produces business charts and graphs in an easy to use package.

The shortcomings? The keyboard for one. While it is possible to get used to the unusual round keys, there is no substitute for the good, solid feel of an Epson QX-10 or TI Professional keyboard. Since the system is not bundled with software, and interface modules are extra cost items, the price can mount up fast. A fully configured Decision Mate V with a good selection of software can cost upwards of $5000, certainly no bargain.

On the other hand, we were impressed with Omninet at Softcon and, for companies wanting this capability, it is a cost effective choice. But even as a stand-alone machine, the Decision Mate V offers a great deal of capability and potential. ■

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modules have either an attached cable or appropriate connector on the rear. The parallel printer module, for example, includes a six-foot attached cable.

The 10Mb Winchester drive, if installed, replaces the floppy disk drive on the left side. Like the floppy disk drives, it has a small red LED indicating operation of the drive.

The system unit has an outward-facing muffin fan at the rear which is all but inaudible. A welcome touch is the orange rocker power switch on the front of the unit and green power-on lamp; this replaces the inaccessible power switch found on the side or rear of many similar computers.

System Software

Three operating systems are implemented for the Decision Mate V: CP/M, CP/M-86, and MS-DOS. Depending upon the options installed, you

Three operating systems are available: CP/M, CP/M-86, and MS-DOS.

can use one or all of these. For our testing, we used CP/M and MS-DOS.

As a protective feature, the MS-DOS master disk supplied with the Decision Mate V will not run until it has been copied onto a backup disk. Although manufacturers generally recommend copying the master disk, you can usually run the disk without doing so. Not so, with this machine. However, page 2.3 of the manual takes you step by step through the format and backup procedure, so it is not an onerous process to create this required backup disk. Once this is done, you are ready to go.

A plain vanilla version of MS-DOS—no menus or fancy stuff—is included. Nor are any of the function keys implemented. Of course, if you want, you can use the CONFIG utility to assign frequently used functions such as DIR, DEL, or COPY to function keys.

CP/M does not have the same protective feature as MS-DOS although it, like the other software disks with the system, is furnished on a disk with a permanent write-protect tab.

In addition to the standard CP/M disk, a second disk containing 15 demonstration and application programs is furnished. We found it curious that the contents of this CP/M disk are described in a supplement to the MS-DOS User's Guide, and there is no hint that they are CP/M programs rather than MS-DOS ones.

These programs include several mediocre games (but after all, you don't buy a computer like this to play games), an excellent real-time clock demo, a continuous graphics demo, a music program with 11 tunes, and an excellent graphics application program.

VEGAS (Very Easy Graphics Application System) is a program written in MBasic which allows you to create line, bar, and pie charts and output them to certain NCR and Epson dot matrix printers. See Figure 1 for a sample graph created on this system.

Both MS-DOS and CP/M functioned as expected. One minor annoyance is the use by the main CP/M screen of black characters on a light blue background; we found this was more difficult to read than the standard green on dark blue used with MS-DOS. Curiously, the CP/M applications programs do use the green/dark blue combination.

Applications Software

Obviously with the availability of MS-DOS, CP/M, and CP/M-86, a great deal of software should be available for the Decision Mate V. As of this writing, NCR has made arrangements with several manufacturers to market customized versions of their packages. These include Microsoft GW Basic; MicroPro *Wordstar*, *SpellStar*, and *MailMerge*; Sorcim *SuperCalc*[2]; and several others. In addition, NCR offers its own business graphics package, DR Graph.

As we have often remarked, *WordStar* is an excellent full-functioned word processing system that should meet the needs of the most demanding user. It is not especially easy to learn, but the spiral bound Training Guide that MicroPro now supplies should make the task easier. Furthermore, it includes the usual extensive printer drivers for every imaginable type of printer in the WSINSTALL module. *WordStar* includes two manuals, a 20-lesson Training Guide in a spiral binder and a fat Reference Manual in a three-ring binder. It also includes a three-panel command card and keyboard overlay which fits over the function keys.

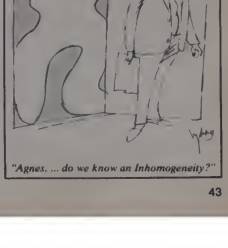
The function keys are not set automatically in *WordStar*. Rather, the WSKEY utility program must be run before you load *WordStar*. Unfortunately, *WordStar* does not take advantage of the color display as does the version furnished with the TI Professional and some other machines. Obviously, people have used *WordStar* for years without color, but having used the color version, we think it is a shame that more manufacturers do not customize the package to take advantage of color.

We were pleased to see that unlike *WordStar*, *SuperCalc*[2] takes advantage of the color display. Row and column labels are yellow while worksheet entries, prompt lines, and the cursor are green. This is a pleasing combination and very easy to read at a glance. *SuperCalc*[2] is an excellent, easy to learn, and easy to use spreadsheet package. It comes with a six-panel reference card, 20-page spiral bound booklet (10 Minutes to *SuperCalc*[2]), and a looseleaf three-ring User's Guide and Reference Manual.

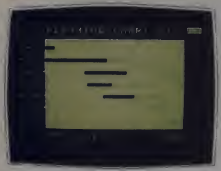
GW Basic is the most advanced version of Microsoft Basic with all of the extensions and graphics statements implemented. Unfortunately, NCR did not follow the lead of Wang and re-do the Microsoft manual, so the user is faced with a three-part manual consisting of the MS-Basic User's Guide, MS-DOS Extension Guide, and GW-Basic Extension Guide. As if that weren't bad enough, none of the three has an index. Although the manual is terrible, GW-Basic is nifty—particularly the color graphics extensions. Using these graphics extensions, we tried some high-resolution plots and were amazed at the detail and clarity of the output, even with several colors mixed.

DR Graph

DR Graph is an interactive software package that lets you create a graph, preview, change, and enhance it before you print or plot it. This menu-driven package can create text-only charts as well as six types of graphs: line, bar, pie, step, stick, and scatter. As you design your graphs, you can generate titles and legends in different type sizes, fonts, and



"Agnes, ... do we know an Inhomogeneity?"



Business graphics can be displayed in monochrome (shown here) or color.

High-resolution monochrome graphics are useful for engineering design.

tion is lost, and small characters are difficult to distinguish. On the other hand, reverse video is used only for notations at the bottom of the screen, so this is not especially bothersome.

Graphics resolution is 640 by 400 pixels (about 15% more than the IBM PC and its clones) so the detail on graphs, schematic diagrams, and engineering drawings is truly amazing. Moreover, this resolution is preserved in all eight colors (black, white, red, blue, yellow, magenta, green, and cyan). The only computer that we have evaluated in this price range with similar color graphics capabilities is the NEC 8801, although several of the other Japanese units have the same specifications.

The display is angled back at about five degrees; there is no provision for tilting or swiveling it.

The Heart of the System

In addition to the display, the system unit contains the mpu, memory, disk drives, and seven expansion slots. The basic unit has an 8-bit Z80A. The 8/16-bit option is contained in a 4" x 4" expansion module that plugs into expansion slot 1. This contains an 8088 mpu and, when installed, the Z80A is automatically dedicated to input and output functions. Graphics are produced by a third mpu, the NEC 7220 graphics chip (which explains why the graphics are the same as those on the NEC 8801). In addition to the graphics chip, separate graphics memory is included in the unit, 32K for the monochrome display and 96K for the color display.

The speed of the Decision Mate V in the standard *Creative Computing* benchmark is comparable to that of other computers in its price range. Although not listed in the specifications, it would appear that the machine is operating at a 2MHz clock rate (see Table 1).

The basic unit includes 64K of user memory. Three plug-in expansion modules, which increase total memory to 128K, 256K, and 512K respectively, are available.

Three plug-in peripheral adapters are available: one for a Centronics-type parallel printer, one for an RS-232 compatible modem, and one for an RS-232 serial printer. In theory, any serial or parallel printer can be used with the Decision Mate V, but, NCR recommends using one of their own units (6411, 6442, or 6455). We used the computer with a Diablo 630, a popular daisywheel unit, and had no trouble although, frankly, we did not try to do any fancy printing or graphics.

Two slimline 5 1/4" disk drives are mounted vertically to the right of the display. They use the reliable quarter-rotation levers to secure the disks rather than fold-down doors. Each double sided, double density drive has a formatted storage capacity of 320K.

Seven 96-pin expansion slots are found in a 4" x 8 1/2" recess in the back of the system unit. These slots accept processor, memory, and I/O port expansion modules. This is a handy design and eliminates the necessity of removing the cover or disassembling the computer to plug in an expansion module. The I/O

Expansion modules can be plugged in without opening the system unit.

Computer	Time	Accuracy*
TI Professional	0:15	.005859375
NCR Decision Mate V	0:22	.005859375
IBM PC	0:24	.01159668

*Lower is better

Table 1. Benchmark test of selected computers.

Disks are held in with reliable, quarter-rotation handles. Controls include screen brightness, sound level, and power off/on switch.

Optional add-ons plug into the back of the unit; no disassembly is required.

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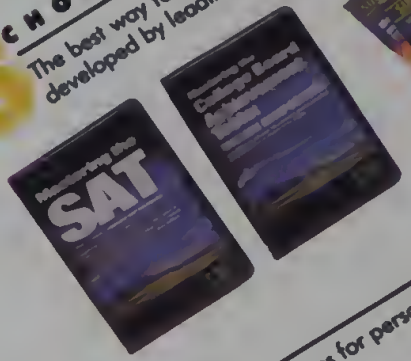

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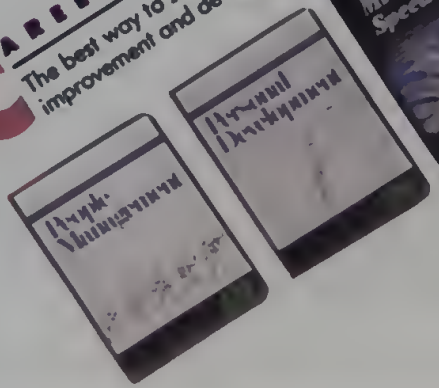

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A shape and color matching game where children help their Sesame Street friend ERNIE match shapes in six different ways! Developed by Children's Television Workshop, ERNIE'S MAGIC SHAPES gives children practice in visual discrimination—an important early learning skill. Children match shapes and colors while the delightful antics of ERNIE'S magic bunny provide reinforcement and encouragement. The manual includes activities that blend fun and learning. For ages 3 to 6.

AVAILABILITY: COMMODORE 64, IBM-PCjr., ATARI

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DUCKS AHOY!™

Developed by Joyce Hakansson Associates, Ducks Ahoy is a discovery game of planning and surprise. Children practice counting skills and predicting outcomes, and are encouraged to think logically while they keep dizzy ducks afloat and avoid the boat-dunking Hippo! Music and lively graphics entertain as they help to develop pre-school skills. Illustrated activity book is filled with ideas for fun and learning. For ages 3 to 6.

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BIG BIRD'S SPECIAL DELIVERY™*

An object recognition and classification game developed by Children's Television Workshop. Children help BIG BIRD and LITTLE BIRD sort mail and deliver packages on Sesame Street. BIG BIRD'S SPECIAL DELIVERY helps children improve their understanding of form, class and function—while having fun! Children feel right at home with their Muppet friends, and the manual is easy to read and includes family activities. For ages 3 to 6.

AVAILABILITY: COMMODORE 64, IBM-PCjr., ATARI

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SEA HORSE HIDE 'N SEEK™

Developed by Joyce Hakansson Associates, Sea Horse Hide 'N Seek is a game of color and camouflage in a novel environment. Children match colors and develop their understanding of size relationships while they help sea horses change color to hide from lagoon-fish and get home! Illustrated Hide Guide shows how animals use camouflage in nature. A preschooler's introduction to the computer. For ages 3 to 6.

AVAILABILITY: COMMODORE 64, ATARI

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MATCH-WITS™

MATH MILEAGE™

PEANUT BUTTER PANIC™

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HALFTIME BATTLIN' BANDS

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TIME BOUND™

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ADDITION AND SUBTRACTION—FOR GRADE LEVELS 1 TO 4

MULTIPLICATION AND DIVISION—FOR GRADE LEVELS 2 TO 8

FRACTIONS: ADDITION AND SUBTRACTION—FOR GRADE LEVELS 5 TO 8

FRACTIONS: MULTIPLICATION AND DIVISION—FOR GRADE LEVELS 5 TO 8

DECIMALS: ADDITIONS AND SUBTRACTION—FOR GRADE LEVELS 5 TO 8

DECIMALS: MULTIPLICATION AND DIVISION—FOR GRADE LEVELS 5 TO 8

LINEAR EQUATIONS—FOR GRADE LEVELS 7 TO 11

QUADRATIC EQUATIONS—FOR GRADE LEVELS 9 TO 12

AVAILABILITY: APPLE II+/IIe, IBM PC/PCjr., COMMODORE 64, ATARI

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Includes analysis of how managers function what qualities define a good monager, a step-by step assessment of your attitudes taward management and managing others, and understanding your strengths and weaknesses as a manager. Emphasis is placed on recognizing your personal preferences as you begin to explare monagement career optians and farmulate steps toward realizing your personal development goals.

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Through self-paced instruction and case studies, you can become a better and more effective manager af people, in both one on-ane and group situations. Examine leadership styles and strategies, motivoting others ta achieve results and building ond evaluating effective teams for business and personal goals. Major emphasis is placed an an understonding of communication and its practical applications.

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Designed ta put you back in control of your reading time, making you a more dynamic, flexible and productive reader. Micro SpeedRead approoches speed reading as an information-gathering process. Pravides reinforcement, encouragement and feedback through strategies tested with students and profassionals in college classrooms and business workshops. Program guide pravides learning abjectives for each lesson and printed practice selections from current periodicals and literoture. With so little time and so much to read, you need MicroSpeedRead. For ages 16 to Adult.

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Twelve tangled webs of crime and puzzlement put your powers of logic and deduction to the test! Begin with a case profile of each carefully constructed murder and then travel a twisted trail of shady characters, false leads, clever deceptions and red herrings in search of clues. A unique Game Clock ticks on as you interview suspects, search apartments or travel across town. Do you have enough evidence to convict? Only the computer knows! With four player capacity, a separate Solution Book, work sheets and tips for successful investigations, Murder By The Dozen has all the makings of a bloody good time! For ages 10 to Adult

AVAILABILITY: APPLE II+/IIe, IBM PC/PCjr, COMMODORE 64

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AVAILABILITY: APPLE II+/IIe, IBM PC, COMMODORE 64

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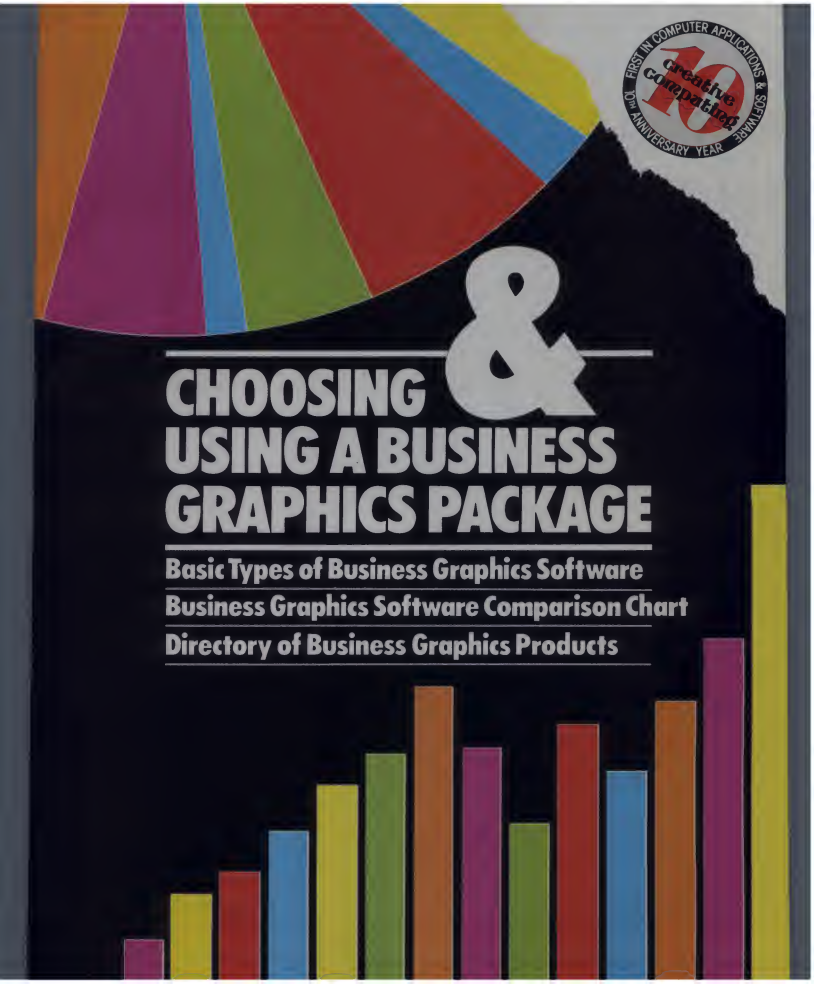

FIRST IN COMPUTER APPLICATIONS & SOFTWARE
10th ANNIVERSARY YEAR
10
Creative Computing
&
CHOOSING
USING A BUSINESS
GRAPHICS PACKAGE
Basic Types of Business Graphics Software
Business Graphics Software Comparison Chart
Directory of Business Graphics Products

Basic Types of Business Graphics Software

Business Graphics Packages: *These packages automatically produce bar graphs, pie charts, line graphs, etc. from data entered by the user. They normally have no capability to manipulate the data or perform transformations on it (e.g.,* PFS: Graph, Super Chartman II*).*

Statistical/Graphics Packages: *This software has the ability to manipulate and/or transform the data after entry as well as to display the results graphically (e.g.,* VisiTrend/Plot, Graph N' Calc*).*

General Purpose Graphics Software: *Although not necessarily intended only for business use, these packages allow the user to design any type of graphic (not just charts or graphs) and often include special features allowing text screens, three-dimensional graphics, animation, and "cut and paste" routines (e.g.,* The Complete Graphics System, MacPaint*).*

Slide Show Software: *This type of package is the computer equivalent of a 35mm slide projector. The graphics created with other programs are stored and sequenced with slide show software to allow organized presentation and display (e.g.,* Executive Briefing System, Frame-Up*).*

Graphics Dump Programs: *This specialized software allows users to print and/or plot graphics displayed on the monitor screen (e.g.,* Paper Graphics*).*

CHOOSING &

Most business presentations you attend (department meetings, sales presentations, annual meetings) are meant to convey some information to those attending; some succeed more than others. These meetings often make use of:

- "Chalk talks" in which one person alternately draws on a board or tablet and talks.
- Slide shows with professionally prepared 35mm color pictures.
- Prepared handouts of either numeric or graphical material.
- Overhead projectors with transparencies.

Most business meetings include graphic tools to get the point across. The reason is simple: graphics convey more information more directly and vividly than any other medium.

A quick look at almost any college textbook, regardless of discipline (economics, sociology, mathematics), reveals numerous illustrations, charts, and graphs. The reason here is also that graphics are a dramatic and informative way to encapsulate large quantities of information. If your business involves transmitting information, you probably should be using graphics to do at least some of the work for you.

While we are interested primarily in business graphics in this section, the programs and techniques mentioned are applicable as well to anyone who teaches, demonstrates, trains, or presents almost anything.

Over the last few years, the variety of graphics software which has become available to microcomputer users has included easy-to-use packages capable of producing presentation quality graphics to communicate many kinds of information. Even so, the potential of the microcomputer is relatively untouched because the computer deals with things mathematically while most people prefer to deal with things visually. The most successful of the new graphics packages we will look at link the mathematical capabilities of the computer with the visual require-

USING A BUSINESS GRAPHICS PACKAGE / BARRY KEATING

ments of the viewer to create a powerful tool for business professionals, teachers, designers, engineers, and others.

Types of Graphics Software

The graphics software available today falls into five main categories:

- Business graphics packages.
- Statistical/graphics packages.
- Freeform or general purpose graphics packages.
- Slide show software.
- Graphics dump programs.

Few of the programs available today fall neatly into only one of the five pigeonholes. Rather, each of these five categories offers different useful possibilities to the business user.

Most of the graphics software marketed directly to business users falls into the first category, business graphics packages. This type of package will represent data as it is most commonly used in business, as bar charts, pie charts, and line graphs. We shall look at examples of each generated by specific programs.

A more powerful group of packages

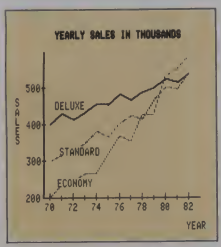


Figure 1. **Produced with *VisiTrend/Plot*, this graphic is a plot of three data series on a single screen. The axes are scaled automatically, and the legend and titles can easily be added by the program.**

(statistical/graphics packages) not only presents the data in graphic form, but also manipulates raw data to get it into a meaningful format. These programs are able to use regression, trend analysis, exponential smoothing, and other statistical operations; store the results of the calculations; and then present the results in pictorial form. Few packages of this sort exist on mainframe computers; this use of integrated analysis and graphics almost requires the use of a microcomputer. (SPSS and SAS, of course, perform these duties on many corporate mainframes but at great expense while requiring some knowledge of programming).

General purpose graphics software is not marketed to businesspeople in particular, but the power of some of these packages (coupled with their ease of use) makes them very useful for displaying anything *other* than the traditional line, bar, and pie charts.

Slide show software turns your micro into a presentation device. These packages make a microcomputer behave (in some ways) like a slide projector.

Graphics dump programs enable you to get hardcopy (printouts) of whatever you can see on your monitor. If you want to pass your graphics around, keep your eye out for this feature.

Let's stress again that most commercial packages are a combination of two or more of the five types of graphics packages.

Your First Presentation

As you step on the elevator Monday morning your section manager, Alice, reminds you that this Wednesday the management team from "corporate" will be in to review the sales of your three product lines. "Could you supplement your presentation with some graphics?" asks Alice. "We need to convince them that our Economy model is the hot item."

A simple request, but to supplement your facts with a graphics display is going to take some time and effort—how much time and effort? Any business analysis involves plotting and graphing numerical data. These numbers could be the dollar sales of different product lines or they could be the results of calculations designed to identify trends and tendencies. What it is going to take to produce the graphics is a pencil, paper, a large work-

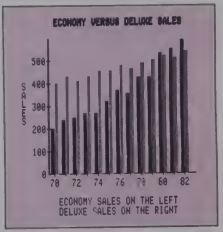


Figure 2. **Also produced with *VisiTrend/Plot*, this graphic places two bar charts side-by-side for comparison.**

sheet, a calculator, some raw data, and a great deal of time or...

With your personal computer you can organize the data, store it, analyze it, manipulate it to your heart's content, and then finally display it. Doing it this way is actually going to save you an immense amount of time rather than making the process more time consuming than it already is. Let's emphasize, however, that this first time through a computer-generated presentation will be a little slow at times. With the correct software, the final product will be first class, but it will take a little learning time the first time around. Those who have to do this once a month or three or four times a year are bound to save much more time than those who give only one presentation each year.

Let's take Alice's suggestion for a presentation and show the actual results you

could achieve. While our case will be a simple one, you should get a feel for how your own, more complicated situations could be presented using the same techniques and software. Thirteen years of sales data (from 1970 through 1982) are available for the three product lines (Economy, Standard, and Deluxe) that your company produces, and you would like to present the sales data graphically in a way that will convey some information about the numbers to your audience.

Two of the most widely used programs that could easily handle this situation are *VisiTrend/Plot* (available for the Apple II, III, and IBM PC) and *Lotus 1-2-3* (available for the TI Professional, DEC Rainbow, Wang Professional, Grid Compass, and IBM PC). Figures 1 through 5 were done with *VisiTrend/Plot;* similar figures could also be produced with *Lotus 1-2-3.*

After keying in the sales data, either of these programs will allow you to:

- Save the data to a disk for later use.
- Analyze the data in some fashion (e.g., calculate summary statistics).
- Plot or graph the raw data.
- Plot or graph calculated data.

Both *VisiTrend/Plot* and *Lotus 1-2-3* are combination business graphics and statistical packages. Figure 1 is a concurrent plot of the sales of each of the three products over time. It quite clearly shows that sales for each of the three are growing over time but that the Economy model appears to be growing in sales much more rapidly than the other two models. The same information (that is, the raw data) was used to produce Figure 2 as well.

Figure 2 highlights the relatively rapid growth in the Economy model when compared to Deluxe sales. A bar chart, like the one in Figure 2, is often more dramatic, especially in color, than the simple line graph of Figure 1. Both *VisiTrend/Plot* and *Lotus 1-2-3* can produce color graphics for screen display, but *Lotus 1-2-3* can also print graphics in up to seven colors, depending on your printer or plotter. *VisiTrend/Plot* is not capable of driving a color plotter. The figures reproduced here, however, were printed on an Epson MX-80 dot matrix printer (no color).

Pie charts, like the one in Figure 3 are often useful for representing a single set of data. Figure 3 shows forecasted 1984 sales shares for each product line.

Often, however, it is necessary to "massage" the data in some fashion, and then display the results. Your company may wish, for instance, to project 1984 Deluxe sales from past sales data. *VisiTrend/Plot* can compute a trend line with a single key command and then display the results as pictured in Figure 4. *Lotus 1-2-3* has some statistical functions built-in (e.g., average and standard deviation), but cannot run regressions or perform trend analysis. *Lotus 1-2-3* does, however, have a built-in spreadsheet program (like *VisiCalc*) and can use data from the spreadsheet for plotting and graphing.

Figure 4. **The results of a simple trend analysis are displayed showing the projected sales in 1984. This graphic required two steps to produce with *VisiTrend/Plot*: first, the trend line was computed; second, that trend line and the actual sales through 1982 were plotted.**

VisiTrend/Plot also has the ability to split the viewscreen into windows for comparison of two graphical pieces of data at one time. Figure 5 shows this feature with the Economy sales trend line at the top of the screen and the Deluxe sales trend line pictured immediately below. Vertical screen splitting is also available in *VisiTrend/Plot.*

Both *Lotus 1-2-3* and *VisiTrend/Plot* are, then, capable of producing line, bar, pie, stacked bar, and X-Y graphs from data either entered from the keyboard or from data files on disk. Both programs allow "what if" graphing by allowing you to produce entirely new graphs with single keystrokes. *VisiTrend/Plot* also has a trend analysis program which allows you to see quickly the results of many types of data relationships such as time series data, stock prices, and production figures. While *VisiTrend/Plot* does not offer the convenience of a built-in spreadsheet as *Lotus 1-2-3* does, it can use information from *VisiCalc* files for further statistical forecasting and graphic display.

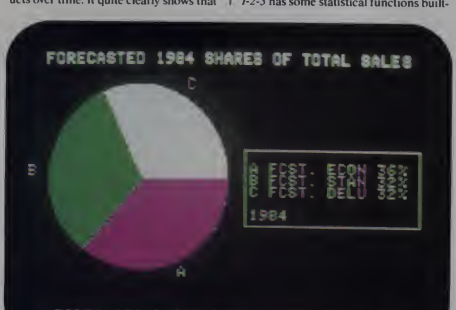


Figure 3. **A pie chart produced with *VisiTrend/Plot* also includes a breakdown of the percentages of total sales in this figure.**

PFS:Graph

Many of the same types of graphics produced with *Lotus 1-2-3* and *VisiTrend/Plot* may also be produced with *PFS:Graph,* a business graphics program that is available for the Apple II and III line and the IBM PC. *PFS:Graph* will as-

semble charts or graphs in color or black and white. *PFS:Graph* can use information in *VisiCalc* files, information entered from the keyboard, or information from its companion program, *PFS:File*. Up to four graphs may be overlaid on a single set of axes just as in *VisiTrend/Plot*. Mixing line and bar graphs and stack graphs or displaying them side-by-side is also a simple task with *PFS:Graph*. The program will print the graphs to a wide variety of printers and will also drive an HP7470A color plotter.

Graph N' Calc

While *PFS:Graph* is only a business graphics program (and not capable of statistical calculations), *Graph N' Calc* for the IBM PC is a completely integrated system that allows you to enter data in a

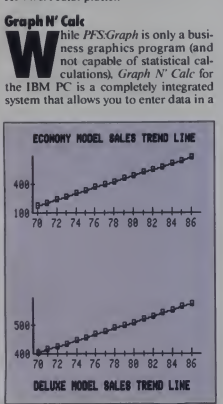


Figure 5. **Split screen projection showing two plots at one time using two horizontal windows is also available with *VisiTrend/Plot*.**

spreadsheet format, perform complex analysis of the data, prepare color graphs using the data, and save and retrieve the data from external storage in DIF (Data Interchange Format). The use of DIF for files in *Graph N' Calc* means that you may use files created by other programs which also use DIF files, such as *VisiCalc, VisiTrend/Plot*, and *1-2-3*.

Graph N' Calc is marketed for serious business forecasting use—that is why the program disk comes with two manuals, one, the standard program manual with a tutorial section (well done) and the second, a 292-page textbook-like manual on forecasting technique. The forecasting book is not directly keyed to the program and includes quite a bit of information which is not relevant to the program at all while leaving out explanations of some of the more powerful features of *Graph N' Calc*. The program, for instance, can calculate internal rates of return which are often used for project selection and net present values, but the book doesn't mention either technique (the Calc section of the program can also use logarithmic transformations, exponential smoothing and polynomial functions).

For display of completed material *Graph N' Calc* can print graphics to either an IBM or Epson printer (a plotter module for the HP 7470A plotter is available for $100 extra), save graphics to disk, or create a slide show of completed graphics.

Super Chartman II

Super Chartman II for the IBM PC closely resembles *PFS:Graph*. *Super Chartman* is not a statistical package in any sense and has no slide show routine; it is strictly a business graphics package that can read DIF files. It does, however, offer a complete set of 20 different chart types including some with a three-dimensional look. It will drive the HP 7470 plotter, the IBM XY-750 plotter, and the HP 7220 plotter; *Chartman* will also drive many printers.

The manual for *Chartman* is written for first time users and includes step-by-step instructions for many common chart types. One interesting addition to the manual is a set of reproducible "graphics requests forms" to allow people unfamiliar with computers to order charts or graphs by filling out a specially designed form which includes some graphics examples as part of the form.

Text As A Graphics Tool

Text screens are also part of any effective business graphics presentation; they provide the explanation for what the viewer has seen or is about to see. Figures 6 and 7 are examples of screens used for presentations. Figure 7 was produced with *Executive Briefing System* which is available for the Apple II and Apple III. Similar text screens could be produced with a variety of other packages (see comparison chart and Figures 8 and 9).

Graphing and plotting programs can be difficult to use (*VisiTrend/Plot, Lotus 1-2-3*, and *PFS:Graph* are notable exceptions) but their output is limited largely to chart format material; to produce text screens *and* present text screen/graphics combination displays you need a program capable of producing multiple text formats interspersed with graphics, many type fonts, and a variety of colors. In addition, you need a simple method of displaying one screen after another (in slide show fashion) for active presentations.

Executive Briefing System and *The Graphics Department* fit the bill perfectly. Let's assume you have produced the graphics screens in Figures 1 through 6, and now you need some text screens to tie the program together; you also need a method for displaying your work that is *foolproof* (after all, the worst thing to have happen in a presentation is a breakdown in the equipment). Aimed primarily at business users, *EBS* is a simple program that allows you to transfer the charts and graphs from other programs to *EBS*, add extremely professional text screens, and select among several formats for the presentation of your material. One important note: *PFS:Graph*, much to my dismay, is apparently unable to produce files readable by *EBS* or any other program with which I am familiar. In other words,

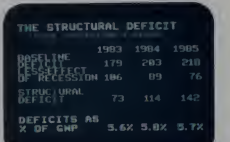

THE STRUCTURAL DEFICIT
1983 1984 1985
DOPE(THE LEG(EFFECT OF RECESSION 186 89 76
STRUCTURAL DEFICIT 73 114 142
DEFICITS AS % OF GNP 5.6% 5.0% 5.7%

Figure 6. **Executive Briefing System text slide.**

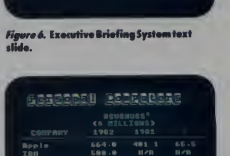


Figure 7. **Text slide done with *The Graphics Department* on an Apple.**

Business Graphics

PFS:Graph graphics may *not* be used by *EBS* or any of the other slide show programs mentioned below. This clearly makes *PFS:Graph* acceptable only for business graphics which will be printed or plotted rather than displayed on a monitor or large screen projector system. While *PFS:Graph* is a bit easier to use than *VisiTrend/Plot*, its limitations in transferring the output to other programs is a real liability.

EBS, however, can use material produced by *VisiTrend/Plot* as well as several other graphics packages. Up to 32 slides can be included on a single *EBS* formatted disk. This includes the *EBS* runtime program (the program that controls the display) which may be transferred to any blank disk. Transfer of graphics from other programs is easy—Figure 2, for instance, created with *VisiTrend/Plot* was saved to a disk with the PIXSAVE command of *VisiTrend/Plot*. After *EBS* was booted, the figure was called onto the screen with the GET command and then saved to an *EBS* slide disk (i.e., a disk with the *EBS* runtime program already written onto it). The entire procedure of creating Figure 2, saving it to a disk, and transferring it to an *EBS* disk took less than ten minutes.

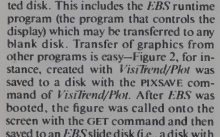

The PROJECT concept
PLAYER Relation
No Name Weight Speed
10 Bonny White 190 4.5
35 Tony Dorsett 195 4.4
54 Randy White 250 4.9
79 Harvey Martin 260 4.8
88 Dave Pearson 180 4.7
Select Weight from Player <-- & PROJECT query

Figure 8. **IBM text slide done with *Hypergraphics*.**

Designing text slides with *EBS* is really quite a bit of fun. To create a text slide like Figure 6 you need to specify in *EBS* the type and size of the font in which you wish to compose. The particular font (typestyle) or size you use can be changed at anytime while you are composing the slide as can the color of the text. Figure 6 uses two different fonts, while Figure 9 uses multiple fonts as well as color. Lotus, which produces *EBS*, also sells an extra disk of accessory fonts, many with both upper- and lowercase and even some special characters to improve your presentations.

The Graphics Department

The Graphics Department is aptly titled. It is a complete set of graphics utilities for the Apple which is built primarily to do the work you might have previously sent to a graphics department within an organization (including text slides). It is a more integrated package than some of the older material available for the Apple and combines the power of many of the older programs with some new twists which make it an extremely useful tool. It is easy to use, too.

What "standard" techniques can you apply with *The Graphics Department?* It is first and foremost a tool for entering, saving, and displaying business data in a variety of formats. Data can be entered from the keyboard or read in from a DIF file (this makes it compatible with data files used by *VisiTrend/Plot*, *VisiCalc*, and many other programs that use DIF data files). Once the data are in place, you can choose any of the familiar bar, line, pie, or scatter formats for display. Grids can be overlaid, and multiple plots can be displayed on a single chart.

Trend analysis, the most common statistical forecasting technique, is handled by *The Graphics Department* as you are given the opportunity to plot additional statistics on any given chart (see Figure 10). These optional statistics include: the mean value, the standard deviation, and a "best fit" trend line (i.e., a simple regression line).

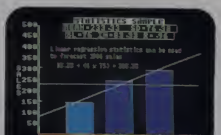
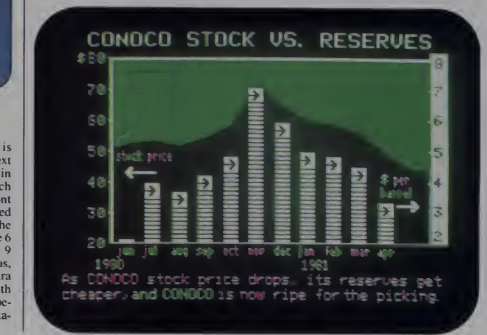


Figure 10. **Trend line with statistics calculated and drawn with *The Graphics Department*.**

Regression analysis in general and other more sophisticated forms of manipulating data are not handled in the program. Up to 99 data points can be used at one time, and any chart type can be used to describe the data once they are in memory (after all, you may not know which type of chart to use in an actual presentation until you try each of them).

If that were all *The Graphics Department* did, it wouldn't be much different from say, *PFS:Graph*. But the system, which includes three double-sided disks, can also use 20 character fonts (Figure 11), more than 100 colors, a specialized set of "graphic tools," and a slide show utility—all in addition to the standard charting utilities (Figure 12). You will find the graphics tools most useful for editing completed slides and pictures. These pictures are saved as normal Apple 33- or

Figure 9. **Executive Briefing System slide.**



34-sector files and are thus compatible with most other programs such as *Executive Briefing System*, *Frame-Up*, and *Screen Director*.

With the tools you can overlay, shrink, and move pieces of a picture at will. You could, for instance, take a chart, shrink it, and place it on a text slide, all in a matter of a few seconds. The tools module also allows the creation of slides and pictures from scratch, changing colors, masking portions of the screen, and adding patterns. With the slide show module, *The Graphics Department* gives you the power to display all your work. A print module allows you to print any screen on an Apple Silentype printer, but any commercial printing program (like *Paper Graphics*) can be used to print anything produced with *The Graphics Department* on a standard dot matrix printer. One final important point: the manual is honestly readable and helpful (or is it just that the program is so easy to use).

Apple Mechanic

Another delightful program for composing primarily text slides (although it lacks the presentation facilities of *EBS* and *The Graphics Department*) is the Beagle Bros. *Apple Mechanic* for the Apple II. This inexpensive ($29.95) program includes six ready-to-use fonts and allows custom building of fonts. Beagle Bros. also sells an accessory disk with 26 extra fonts; that should be enough of a selection of letters, numbers, and special characters to keep anyone happy. Typing text screens with *Apple Mechanic* is simple with the Xtyper program, which allows upper- and lowercase as well as various colors. Changing fonts while composing is even easier than in *EBS*, so a single slide can use as many different fonts and colors as you like.

MacPaint

MacPaint clearly falls into our general purpose graphics package category. The accompanying pictures printed on an Apple Imagewriter should demonstrate its usefulness for producing quality graphics in a business environment. *MacPaint* on the Macintosh is by far the simplest of all the graphics generators described here.

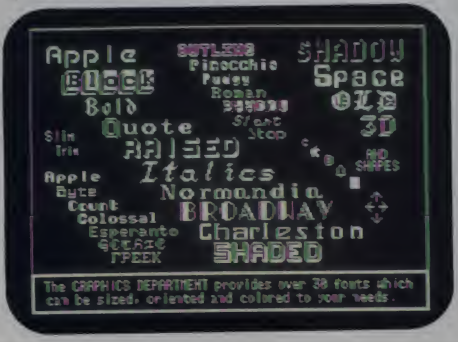
The manual for the program is trivial—who needs it? It is like providing a manual for a lead pencil. The program is most like Penguin's *Complete Graphics System* with icons representing things you would like to do. You just point and choose. Text and graphics can be easily mixed because the Mac uses only a hi-res screen (and it is really hi-res) (see Figure 13). There is no color, but there are many different types of shading. Anything on the screen can be dumped to the printer by selecting the print option with the mouse.

Slide Shows

After you make the slides, you still need a way to display them. *Apple Mechanic* slides are useable by *EBS* and *The Graphics Department*, but if you want a less expensive display routine, I suggest the Beagle Bros. *Frame-Up*. (*EBS* costs $199, *The Graphics Department* sells for $124.95, and *Frame-Up* sells for $29.50). While *Frame-Up* (for the Apple II) is not nearly as sophisticated and capable as *EBS* or *The Graphics Department* it is simple, easy to use, and cheap. Learning to use it takes about ten minutes. It performs three important functions: it allows composition of simple, one-font text screens; it displays slides in rotation at the press of a paddle button or arrow key; and it performs unattended

Figure 12. **Standard charts are automatically produced by *The Graphics Department*.**

Figure 11. **Different type fonts are available in *The Graphics Department*.**



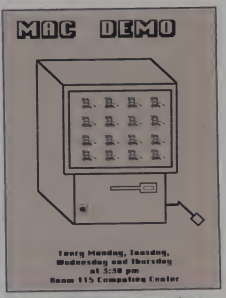


Figure 13. MacPaint **screens dumped to an Apple Imagewriter printer with the PRINT command.**

Business Graphics Software

	VisiTrend/VisiPlot	Lotus 1-2-3	PFS: Graph	Executive Briefing System	Apple Mechanic
Host Personal Computer*	Apple II, III, IBM PC	IBM PC	Apple II, III, IBM PC	Apple II	Apple II
User Interface	Menu	Menu	Menu	Menu	Keyboard overlay
Calculate Simple Statistics	Yes	Yes	No	No	No
Regression/Trend Analysis	Yes	No	No	No	No
Create Text Slides	No	Yes	Yes	Yes	Yes
Create Plots/Graphs (line, bar, pie)**	Yes	Yes	Yes	No	No
Create Pictures	No	No	No	No	No
Move Objects (animation)	No	No	No	No	No
Print Screens (slides)	Yes	Yes	Yes	Yes	No
Slide Show (auto-sequence)	No	No	No	Yes	No
Modify Graphics Slides	No	No	Only its own slides	Yes	Yes
Allows Freehand Drawings	No	No	No	No	No
3-D Rotations	No	No	No	No	No
Drives Plotter	No	Yes	Yes	No	No
Special System Requirements	128K, two disk drives for IBM PC version	192K, two disk drives color graphics			
Suggested List Price	$300-IBM $300-Apple	$495	$140-IBM $125-II $175-III	$199	$29.50

*Apple II refers to Apple II+ as well as Apple IIe systems. Most Apple II packages will also work on the Apple III in emulation mode. Also, most IBM PC programs will run on appropriately configured IBM PC compatibles.
**Created from data and drawn automatically.

by showing slides in the order you choose with a time delay chosen by you. It also has an instruction booklet which is hilarious (like all the Beagle Bros. materials). *Frame-Up* doesn't do anything other programs don't do, but it does the basics quite well indeed.

Another Apple slide show program is *Screen Director,* an exceptionally easy to use program but one quite different in concept from *Frame-Up, EBS,* or *The Graphics Department* slide show module. *Screen Director* is actually a simple language with which you create and edit text slides as well as print the slides and/or present them in slide show fashion. *EBS, Frame-Up,* and *The Graphics Department* use menus to guide you through the program; choices are highlighted on the screen, and you move a cursor to select a particular procedure. In *Screen Director* the system is quite different. First, *Screen Director* requires two drives for production of materials, although only one drive is needed for showing presentations. Second, *Screen Director* uses English-like commands to control the system. For example: SHOW FROM 1 AUTOMATIC 10

Figure 14.* Part of an animated sequence, this chart was drawn with the KoalaPad and *The Graphic Solution.

A reference card is included with *Screen Director,* and the language is almost easy enough to use that the manual becomes more of a reference guide than a piece of required reading (I recommend, however, that you read at least the tutorial section of the manual). *Screen Director* accepts screens from most packages, in-

Comparison Chart

Frame-Up	Screen Director	The Graphic Solution	VCN Executivision	EnerGraphics	4-Point Graphics	KoalaPad
Apple II	Apple II	IBM PC	IBM PC	IBM PC	IBM PC	Apple II, IBM PC
Menu	Command language	Menu	Menu	Menu	Status line	Touch sensitive pad
No	No	No	No	Yes	No	No
No	No	No	No	Yes	No	No
Yes	Yes	Yes	Yes	Yes	Yes	No
No	No	No	Yes	Yes	No	No
No	No	Yes	Yes	Yes	Yes	Yes
No	No	Yes	Yes	Yes	Yes	No
No	Yes	Yes	Yes	Yes	Yes	No
Yes	Yes	No	Yes	Yes	Yes	No
No	No	Yes	Yes	Yes	Yes	Yes
No	No	No	No	No	No	Yes
No	No	No	No	Yes	No	No
No	No	No	No	Yes	No	No
			128K, two double sided disk drives, color graphics board	128K, color graphics board	128K, color graphics board	
$29.50	$150	$149.95	$395	$250 Plotter $100	$225	$125

Figure 15. **PERT chart drawn with *CGS* using a KoalaPad and lettered with *The Complete Graphics System*.**

cluding *VisiTrend/Plot* and *Apple Mechanic*, but also has the ability to create and edit text slides. One unfortunate feature is that there is no way to add or delete material on a graphics slide. This is a real disadvantage if you wish to modify a *VisiTrend/Plot* slide; it simply cannot be done. *EBS* and *The Graphics Department*, on the other hand, do have the ability to modify graphics slides (by adding text, for example).

If you wish to use hardcopy handouts with a presentation, *Screen Director* will print all its screens to many printers as well as to the IDS Prism Color Printer. *Screen Director* will not, however, print your choice of slides but will print only all of the slides listed for one "show." Up to 17 graphics may be stored on a single disk.

One of the very attractive features of *EBS* is that it offers several methods for switching from one slide to the next (dissolve, curtain rise, spiral cut). These transitions between slides enhance the presentation enormously. *Screen Director* and *The Graphics Department* have fewer options. One quite useful inclusion in the *Screen Director* package is a slide changer like those used with 35mm projectors. The two buttons work to advance and recall slides just as they would were you actually using a slide projector.

Animation, Freeform Graphics, and Unusual Devices

We have dealt with entering and transforming data, displaying the results as graphs and charts, creating text screens for explanation, and, finally, showing the

Business Graphics Software

	HyperGraphics	The Graphics Department	Paper Graphics	Super Chartman II	Graph N' Calc
Host Personal Computer*	IBM PC	Apple II	Apple II	IBM PC	IBM PC
User Interface	Menu	Menu	Menu	Menu	Menu
Calculate Simple Statistics	No	No	No	No	Yes
Regression/Trend Analysis	No	No	No	No	Yes
Create Text Slides	Yes	Yes	Yes	Yes	Yes
Create Plots/Graphs (line, bar, pie)**	No	Yes	No	Yes	Yes
Create Pictures	Yes	Yes	No	Yes	Yes
Move Objects (animation)	Yes	No	No	No	No
Print Screens (slides)	No	Silentype only	Yes	Yes	Yes
Slide Show (auto-sequence)	Yes	Yes	No	Yes	Yes
Modify Graphics Slides	Yes	Yes	No	Yes	Yes
Allows Freehand Drawings	Yes	Limited	No	No	No
3-D Rotations	No	No	No	No	No
Drives Plotter	No	No	No	Yes	Yes
Special System Requirements	128K, color graphics board			128K, color graphics board	Color graphics board
Suggested List Price	$395	$124.95	$49.95	$425	$125

*Apple II refers to Apple II+ as well as Apple IIe systems. Most Apple II packages will also work on the Apple III in emulation mode. Also, most IBM PC programs will run on appropriately configured IBM PC compatibles.
**Created from data and drawn automatically.

results as a slide show. Now that is quite a bit of ground for anyone to cover, but we haven't done anything that couldn't be done by a professional graphics department with plenty of time, a 35mm slide projector, and a lot of money. But can the computer make sophisticated presentations that do things that slide projectors are incapable of matching? You bet!

Several software packages offer powerful animation routines, sometimes in conjunction with other useful features (like 3-D graphs or libraries of prepared graphics). For the Apple II, II+ and IIe the most complete and easy to use of these packages are *The Graphic Solution* and *Graforth*. For the IBM PC there are three packages in this category: *Execuvision, Hypergraphics,* and *Energraphics*. Each of these packages has both strong points and weak points.

Usually the use of animation in presentations requires the knowledge of a programming language like Basic, Pascal, or Forth, but few business users are willing to spend their valuable time learning the languages needed to address the specific graphics features of their computers.

What the businessperson (or teacher, consultant, guide, or trainer) really needs is a package that gives him the ability to create presentation quality animations and displays with relative ease.

The Graphic Solution

The Graphic Solution is one of the few Apple software packages featuring animation that could conceivably be used by a neophyte. It is a friendly system, but be aware that to create complicated animations with it requires some practice. The basic technique is to create "movies" or animated sequences frame by frame. The frames may then be edited, shown in sequence, deleted, or added to previous work. Some quite complex work can be handled by *TGS*—large image animation, animation over colored backgrounds, flicker-free animation, scrolling, and animated text—but it takes time to learn the system. A knowledge of Applesoft Basic is also helpful for some of the applications. The documentation for *TGS*, which comes in a small three-ring binder, is well done and includes a tutorial as well as a quick-and-dirty introduction to using the package. A demonstration disk offers some insight into the capabilities of the

Figures 16–19. **Sequential pictures of a three-dimensional rotation performed by *Graforth*.**

Comparison Chart

Super Slide Show	Graforth	Complete Graphics System	PC-Draw	MacPaint	Chartmaster
Apple II	Apple II, III, IBM PC	Apple II	IBM PC	Macintosh	Apple, IBM, TRS-80
Command language	Forth language	Menu	Menu	Mouse	Menu
No	Requires programming	No	No	No	Yes
No	Requires programming	No	No	No	Some
No	Yes	Yes	Yes	Yes	No
No	Requires programming	No	No	No	Specialized
No	Yes	Yes	Yes***	Yes	No
No	Yes	No	No	No	No
No	No	No	Yes	Yes	Yes
Yes	Requires programming	No	No	No	No
No	No	Yes	Yes	Yes	No
No	Yes	Yes	Yes***	Yes	No
No	Yes	No	No	No	No
No	No	Yes	Yes	No	No
					128K IBM, two disk drives, color graphics board
$25	$75	$79.95	$250	Included with machine	$275

***Creates architectural type drawings.

package.

I found the most useful feature of *TGS* to be its ability to use completed screens created with other packages (like *Visi-Trend/Plot*) as backgrounds for animation in presentations.

TGS also offers one other feature of potential interest to business users which could easily be overlooked. Accent, the manufacturer of *TGS*, also sells a *TGS*/KoalaPad interface which allows you to use a KoalaPad to input graphics into *TGS*. Since the KoalaPad has been marketed primarily for home use, its application in business graphics may be overlooked. The KoalaPad is not really a software package; it is actually a small graphics tablet sold with *Microillustrator*, a software package needed to use the pad. By itself, the small KoalaPad along with *Microillustrator* is capable of producing some interesting graphics which can be saved and used with other packages (Figure 14). To draw, you use a stylus (provided) or even your fingertip to trace lines on the touch sensitive pad. The KoalaPad for the Apple plugs into the gameport

(there is also a KoalaPad for the IBM PC) and allows freehand drawing in any of 16 colors—something no other package mentioned in this article can do. The *MicroIllustrator* package uses a rubber band cursor to help draw straight lines, boxes, and circles.

The Complete Graphics System

The Complete Graphics System (CGS) is a close relative of the *MicroIllustrator* package. It is also an Apple package and can be used with the KoalaPad, but it is much more powerful than *MicroIllustrator*.

CGS is a generalized graphics package. It will not, for instance, plot the standard charts after you have entered numerical data, nor will it perform any statistical analysis, but it does offer a simple method for producing freestyle graphics for business (as well as text slides) in a "quick and dirty" manner. *CGS* is, above all, simple to use—the manual is less than 60 pages long and most of that you will read only once. With *CGS* you are offered a variety of input devices: the KoalaPad, joystick, trackball, Apple Graphics Tablet, Houston Instruments HiPad, Apple Mouse, or the reliable old keyboard. It is definitely easiest to draw with this package using one of the graphics tablets. We did not have an opportunity to try it with the mouse, but that is a close analog of a tablet and so will probably be just as easy to use.

Like *MicroIllustrator*, *CGS* draws perfect rectangles, circles, and straight lines for you; unlike *MicroIllustrator* it also helps draw ellipses, arcs, and triangles. The combination of 96 different brushes and more than 100 colors with these techniques boggles the imagination, but each technique is as easy to use as pointing to it.

Drawing is only one of the facets of *CGS*; it also produces text screens (only one font is included with the program, but 50 additional fonts are available from Penguin), draws three-dimensional objects, and drives most plotters (we tried it with an Amdek Amplot, and it performed flawlessly). Like *The Graphics Department* it also shrinks screens or parts of screens and allows you to move one part of the screen to another picture or another part of the same picture.

If you already own a KoalaPad, Apple Graphics Tablet or HiPad, you ought to have *CGS* to take full advantage of its features. Even from the keyboard, however, *CGS* is a powerful general purpose graphics package.

Figure 15 is a PERT chart drawn with the KoalaPad and *CGS*; text was added with *The Graphics Department*. The lines were defined by specifying the two endpoints, while the circles were defined by picking the center of a circle and then expanding the radius by choosing another point. This graphic could be saved to disk and used by another package (*EBS*, for instance) or used as a background for animation by *TGS*.

While *The Complete Graphics System* can draw three-dimensional graphics and *The Graphic Solution* can create real animation, neither one can actually animate the three-dimensional color graphics themselves. That is the strong point of a program written by Paul Lutus called *Graforth* which is available for the Apple as well as the IBM PC.

Graforth

Graforth, however, is not for the novice. It is actually a programming language that allows some rather fast and slick animation. That means that to use the program, you must learn this modified Forth system—Reverse Polish Notation and all. For someone familiar with Basic, Pascal,

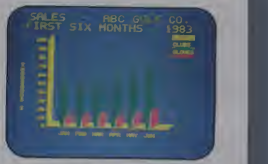


Figure 21. **Screen created with *Hypergraphics* for use in its "presentation" facility.**

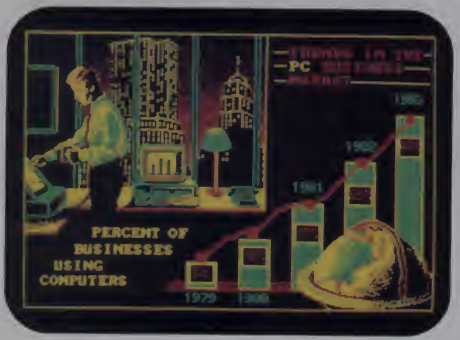


Figure 20. **This figure uses *Execuvision's* business graphics ability as well as the library of pre-rendered graphics included in the basic package.**

or even Fortran the task is relatively simple (but time-consuming), but for others it may be too time-consuming to be worthwhile.

Once the language is mastered, however, true three-dimensional objects can be moved about the screen and text placed anywhere you want it (see Figures 16–19). For some types of demonstrations this capability just can't be beat. It is the type of demonstration that cannot be duplicated with a chalk-talk, a set of overheads, or even a slide projector. Only a movie comes close to representing the type of displays *Graforth* is capable of creating. This specialized program is not for all, but it may be just perfect for a few users.

But *TGS* and *CGS* are not available for IBM PC users. Not to worry! IBM users have available to them three powerful and complete packages which are capable of producing many of the types of graphics we have already described with animation as well as some novel additions.

Execuvision

Execuvision is a very complete newcomer to the IBM PC market; its ease of use and totality of coverage are a delight. It can generate the normal business graphics (pie charts, bar graphs, etc.), overlay text, or create text screens. It also allows sketching, uses animation and special effects, and includes a complete slide show (automatic run-time option). *Execuvision*, however, does require somewhat more than the basic IBM PC system to operate; requirements are 128K, PC DOS 1.1, two double-sided disk drives, and a color/graphics monitor.

Execuvision is really a *very* complete package; it also is compatible with the IBM PC version of *VisiTrend/Plot*. Figure 20 represents a unique feature of the package: *Execuvision* includes a library of pre-rendered images for use in your presentations. Some of these library images are included with the basic package while others are available separately. The library subjects currently available are:

- Borders Collection.
- Initials and Decorative Design Collection.
- Industry and Business Catalog Collection.
- Professions: The World's Faces and Figures Collection.
- Maps and International Symbols Collection.

It surprises me that there is no comparable collection of images and backgrounds for Apple users. The use of pre-rendered graphics is certainly the easiest of all graphics techniques (i.e., "let someone else do it"). The *Execuvision* library, though, is not the most impressive part of the package; the integration of all the desired graphics techniques in one easy to use package is clearly its strong suite. No other package mentioned here combines practically all the features of the menu-driven *Execuvision*. Even considering its heavy hardware requirements and price ($395) it stands apart from other packages. A glance at the comparison chart accompanying this article will emphasize the breadth of the *Execuvision* program.

Hypergraphics

Hypergraphics is a very sophisticated general purpose graphics package for the IBM Personal Computer; it offers features that are unavailable in other software but similar in some ways to *TGS* for the Apple. *Hypergraphics* is designed primarily for executive users but will probably take longer to master than either *Execuvision* or *Energraphics*.

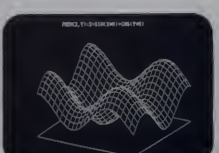
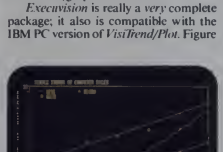


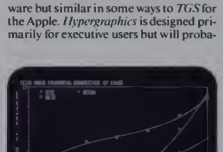
Figure 24. **This three-dimensional surface was drawn by specifying the function and the ranges over which to plot it. The surface may be viewed from any angle by rotating the surface from the *Energraphics* menu.**

The producers of *Hypergraphics* believed enough in their product to present the tutorial in disk form rather than in the usual walk-through manual format. The tutorial itself is produced with *Hypergraphics*. A user's manual, provided in book format, is meant to be used only as a reference manual to answer specific questions. The disk tutorial is well done, but often you need to look something up while you are in the middle of producing a presentation—that is a bit difficult if the tutorial itself is on disk.

The unique feature of *Hypergraphics* is that it can become part of one of your own programs; you may transfer control back and forth from your control program to *Hypergraphics* as needed. This means that all the capabilities of *Hypergraphics* are available within your own programs, but you do not need to learn a specialized programming language to do animation and freeform graphics. To use *Hypergraphics*, you need not know how to program, but its use in your own programs is one of its most powerful features. The *Hypergraphics* system creates presentations by making files which consist of many (up to 999) pages numbered consecutively and linked in that order. You use the *Hypergraphics* program to place information on each page.

The information you place on any given page may consist of text, graphics, and/or animation commands. Each page is distinct and can be edited separately just as each frame of a *TGS* movie could be edited on the Apple (Figure 20). Pages may be copied onto new "blank pages" and then altered slightly to show progressions of text or graphics. The presentation facility of *Hypergraphics* is like the projector module of *TGS*; both allow the pages or frames to be viewed in some preselected order. Both *Hypergraphics* and *TGS* are different from slide shows because they allow true animation and





Figures 22 and 23. **These figures use trends (Fig. 22) and polynomial regression (Fig. 23) to plot sales of three different types of computers. Both statistical analysis and drawing are handled from the *Energraphics* menu.**

because they can be called from your own programs.

Text pages may be sent to a printer, and screen images may be saved to disk in a format useable by other packages. There are no provisions for plotting.

EnerGraphics

An entirely different sort of package for IBM PC users is *EnerGraphics* which also requires 128K, two double-sided disk drives (or one drive and a hard disk), a graphics monitor (preferably color), an IBM (or compatible) graphics adapter board, and a dot matrix printer. This package requires a bit more hands-on time before you can produce presentation quality graphics when compared with *Execuvision* (and less time than it takes to master *Hypergraphics*) but that is not surprising since *EnerGraphics* is a statistical/graphics package designed to do several unique things:

- In addition to the standard pie charts and line graphics, *EnerGraphics* can do statistical analysis or fit straight line or polynomial functions (user definable) to data and plot the results (see Figures 22 and 23). It can also perform linear and polynomial regression (quite useful for economists and forecasters).
- While *Execuvision* can produce bar charts with a 3-D look, *EnerGraphics* can produce real 3-D surfaces including color, zoom capability, rotation, hidden line removal and perspective (see Figure 24).
- *EnerGraphics* also performs as a sort of word processor by allowing you to edit charts, graphs, or designs with easily addressed symbols (see Figure 25). The authors suggest such applications as flow charts, floor plans, and mechanical drawings.

EnerGraphics also has the ability to produce text screens interspersed with special user-defined symbols, and is compatible with DIF files. A slide presentation program included in the package allows you to display completed graphics in the familiar slide show fashion.

Figures 24 and 25 are produced with *EnerGraphics* using its simple menu-driven production routines. These screens can be saved and used in the slide show routine (included) or printed or plotted for hardcopy handouts. *Execuvision*, *EnerGraphics*, and *Hypergraphics* all offer demonstration disks for prospective purchasers, which provide an exciting method of viewing each package in action.

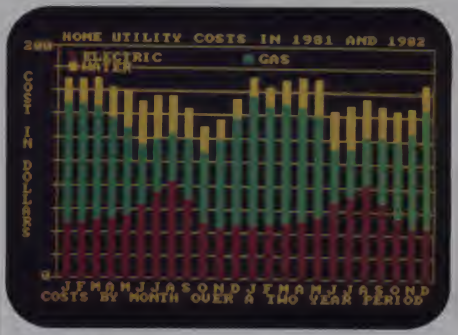

HOME UTILITY COSTS IN 1981 AND 1982
ELECTRIC
GAS
WATER
COST IN DOLLARS
200
0
J F M A M J J A S O N D J F M A M J J A S O N D
COSTS BY MONTH OVER A TWO YEAR PERIOD

***Figure 25. Energraphics* slide with a combination of text and graphics.**

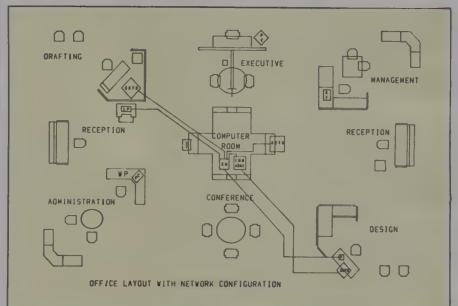


***Figure 26. PC-Draw* draftsman-like rendering.**

Single Purpose Programs

Some programs just do not fall into the general categories we outlined earlier; *PC-Draw* is one of these. While it will no doubt be very useful and even a necessity for some users, it is a specialized tool designed to mimic the art of a draftsman (see Figure 26). With *PC-Draw* you can make up specialized templates which consist of symbols you may elect to use anywhere on the graphics page. Presumably, an engineer would make up one template while an architect might use a different template altogether. Some ready-made templates are included with *PC-Draw* but you are provided with tools to create new templates for any specialized task.

PC-Draw is designed mainly to complete drawings of any type which use repetition of a symbol or graphic design. Drawings are saved to disk or printed in one of many different modes (e.g., regular, compressed, emphasized). While most users will probably use *PC-Draw* with keyboard entry, the program does

support light pen entry. Two modes are provided for drawing; one is a high-resolution (640 x 200 pixels) black and white mode while the other is a medium-resolution (320 x 200 pixels) color mode.

Chartmaster

Chartmaster is another single-purpose package for people who require a charting tool for financial and commodity markets. The program is most useful to those who follow some markets quite closely and depend heavily upon certain chart forms and statistics as predictors of future prices or trends. An automatic updating system allows a phone call (via modem) to supply daily information to be absorbed by *Chartmaster* without the need to key the data in by hand.

Chartmaster is a highly specialized package intended only for investors, as evidenced by the types of specialized graphics it produces: high-low-close bar charts, point-and-figure charts, moving average charts, and spread charts/basis charts.

The IBM version of the program can handle 450 trading days of information on a number of different stocks or commodities and display the information in graphic form. Charts may be "zoomed" to explode the price action covering a particular period or scrolled in *VisiCalc* fashion to view earlier trading. It sure beats looking all the data up and charting it by hand. Trendlines (actually ten different forms of trend analysis) are available as well as five different moving averages.

The update-by-modem feature of *Chartmaster* is optional, and you may enter data manually if you so desire. Manual data entry is quick because the program is designed to accept data in recognized formats only, allowing for weekends and so on. The manual includes not only instructions on how to use *Chartmaster* but also a tutorial on hedging and finding buy and sell signals in commodity markets. This software offers you a solid opportunity either to lose your lunch money or to strike it rich.

One final note about specialized packages has to do with the color screen photos accompanying this article. Most of the graphics shown here were reproduced on 35mm slides by Computer Slide Express. This company provides the service of turning your Apple or IBM graphics into 35mm color slides or overhead transparencies. You mail them your 5¼" disk with the graphics on it, and they return your unaltered disk and the slides or overheads within a few days. You may even send your Apple graphics over the phone via modem with a software package supplied by them; each slide requires about two minutes to transfer in a packed format (using a routine written by Mark Pelczarski of Penguin Software.) ■

Directory of Business Graphics Products

Company Names, Addresses	Product, Computer(s) Price, Comments
Beagle Bros. 3rd floor 4315 Sierra Vista San Diego, CA 92103 (800) 854-2003	*Apple Mechanic* (Apple)/**$30**/An easy to use utility package which includes a text generator for creating text slides or adding text to existing slides.
Professional Farm Software 219 Parkade Cedar Falls, IA 50613 (800) 553-2910	*Chartmaster* (Apple, IBM, TRS)/**$275**/Specialized commodity and stock trading graphic aid allowing updates by telephone.
Penguin Software 830 4th Ave. P.O. Box 311 Geneva, IL 60134 (312) 232-1984	*The Complete Graphics System* (Apple)/**$79.95**/Truly a complete general purpose graphics producer. Extremely easy to use with options galore. Allows input from keyboard, mouse, joystick, or graphics tablet. Even drives a plotter.
Computer Slide Express Visual Horizons 180 Metro Park Rochester, NY 14623 (716) 424-5300	*Computer Slide Express* (IBM, Apple)/**$6 per slide**/This company produces 35 mm slides or overhead transparencies from your computer's graphics. You send the disk; they return both disk and slides.
Enertronic Research, Inc. 150 North Meramec, Suite 207 St. Louis, MO 63105 (800) 325-0174	*Energraphics* (IBM)/**$250**/Multi-faceted package capable of many statistical operations in addition to true three-dimensional graphics. An excellent forecasting and display package for business uses.
Lotus 161 1st St. Cambridge, MA 02142 (617) 492-7171	*Executive Briefing System* (Apple)/**$199**/General purpose graphics and presentation package. Quite easy to use.

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IMSI 633 Fifth St. San Rafael, CA 94901 (415) 454-7101	*4-Point Graphics* (IBM)/**$225**/Menu-driven general purpose graphics package with slide show routine for presentations.
Beagle Bros. 3rd Floor 4315 Sierra Vista San Diego, CA 92103 (800) 854-2003	*Frame-Up* (Apple)/**$30**/Slide show routine also capable of producing text screens.
Insoft, Inc. PO. Box 608 Beaverton, OR 97005 (503) 641-5223	*Grafonth* (Apple, IBM)/**$75**/Programming language capable of producing fast, smooth three-dimensional rotations, text screens and many types of two-dimensional graphics. Not for the novice.
Sensible Software, Inc. 6619 Perham Dr. West Bloomfield, MI 48033 (313) 399-8877	*The Graphics Department* (Apple)/**$124.95**/A combination business graphics package and general purpose graphics producer with many options (e.g., standard charts, slide show, many type fonts, etc.). A bargain considering its many talents.
Accent Software, Inc. 3750 Wright Pl. Palo Alto, CA 94306 (415) 856-6505	*The Graphic Solution* (Apple)/**$150**/Unique general purpose graphics package which features animation. Can be used with a KoalaPad with a software interface provided by the same company.
Desktop Computer Software, Inc. Suite 29-303 303 Portrero St. Santa Cruz, CA 95060 (408) 458-9095	*Graph N' Calc* (IBM)/Combination statistics and graphics especially useful for forecasting. Many statistical options used in spreadsheet format. Produces standard business graphics.
Hypergraphics Corporation 807 West Hickory, Suite 202 Denton, TX 76205 (817) 565-0004	*Hypergraphics* (IBM)/**$395**/General purpose graphics package that can be used in your own programs along with self-contained productions and presentations. On-disk tutorial. Capable of animation.
Koala Technologies Corp. 4962 El Camino Real Suite 125 Los Altos, CA 94022 (408) 986-8866	*KoalaPad/MicroIllustrator* (IBM, Apple, Commodore, Atari)/**$125**/Small graphics tablet with software for producing free-form graphics. Easy to use and quite reasonably priced.
Lotus 161 1st St. Cambridge, MA 02142 (617) 492-7171	*Lotus 1-2-3* (TI Professional, DEC Rainbow, Wang Professional, Grid Compass, IBM PC)/**$495**/A combination spreadsheet, database, and graphics package capable of the standard business graphics and some statistical calculation. Widely used.
Apple Computer Inc. 20525 Mariani Ave. Cupertino, CA 95014 (408) 996-1010	*MacPaint* (Macintosh)/**comes with system**/General purpose graphics package similar to *The Complete Graphics System* for the Apple II. Very easy to use.
Penguin Software 830 4th Ave. P.O. Box 311 Geneva, IL 60134 (312) 232-1984	*Paper Graphics* (Apple)/**$49.95**/Screen dump allowing the printing of any screen to a multitude of printers. Many options including magnification, adding text, rotation, etc. Good value.
Micrografx, Inc. 1701 N. Greenville, Suite 703 Richardson, TX 75081 (214) 234-1769	*PC-Draw* (IBM)/**$250**/Specialized drawing tool for creating extremely fine architectural-type flowcharts, organization charts, layouts or forms. Uses a template for symbol selection.
Software Publishing Corp. 1901 Landings Dr. Mountain View, CA 94043 (415) 962-8910	*PFS Graph* (IBM, Apple)/**$125–$175**/Business graphics package which is part of a complete line of software including a database manager (*PFS File*) and a word processor (*PFS Write*).
Business and Professional Software, Inc. 143 Binney St. Cambridge, MA 02142 (617) 491-3377	*Screen Director* (Apple)/**$150**/Slide show program which uses a simple command language. Comes with a hand controller for presentations.
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Graphic Software Inc. 1972 Massachusetts Ave. Cambridge, MA 02140 (617) 491-2434	*Super Chartman II* (IBM)/**$425**/Business graphics package designed to produce the standard chart sonly.
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Growing Up Literate

Spelling and Spatial Relationships

Betsy Staples

This month, all the programs we review are of excellent quality. We look at two spelling packages and a reading program designed for elementary school students.

The publishers of these fine programs range from one of the best known producers of educational software in this country to a tiny company we first saw in a mini-booth at the West Coast Computer Faire to a Canadian company with distributors in the U.S. and U.K.

Spelldiver

Spelldiver from Scholastic Wizware is another offering from educational game designer extraordinaire Tom Snyder. The setting is the ocean floor on which you find words covered with a thick seaweed-like lettermoss. Your assignment is to remove enough of the lettermoss to enable you to guess the word.

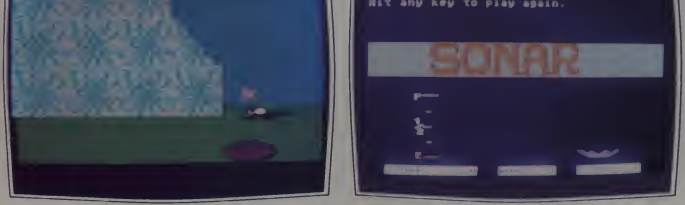
The cleaning process is not difficult; you have only to swim over the mossy letters, and the area over which you pass is cleared. Once you have cleared a portion of a letter, you can switch on your sonar scope and view all the uncovered areas at once. When you think you can identify the word, you must swim back to your boat and type in your guess, but be careful, you get only one free guess per word and you must spell it correctly the first time.

Additional factors that keep the game interesting include a limited supply of air, pearls on the sea floor that can net you extra guesses, and the flipper-nipper whose bite immobilizes you long enough to waste some of your precious air.

You score 50 points for each letter that you identify correctly and 15 points for each pearl you have left after guessing the word. You can earn extra points by identifying the word before your air supply is exhausted.

You control the confident lady swimmer Oshianna Jones with the joystick and switch back and forth from the undersea scene to the sonar scope by pressing the fire button.

There are three modes of play. The first, Gabdoc's Notes Home, gives you a bit of an advantage by showing the context of the word. The notes, which are printed in the instruction manual, purport to have been written long ago by a creature from outer space. Each of the 30 notes has 20 missing words which range in length from three to ten letters.



Spelldiver

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Dashes indicate the letters in each missing word.

The notes tell an amusing story and provide effective practice in using context to derive hints about unfamiliar words. The higher numbered notes are longer and feature longer words. They reward players who have worked to build their vocabularies simply because it is easier to guess a word in context if you know its meaning.

The second mode of play is called Power Spelling. If you choose this mode, the words that must be identified are chosen from a list of 2000 commonly used words. As play begins, you specify the number of letters (3-10) you want to be in the words you will be guessing. In some ways, it is more difficult to guess the words in this mode, because you have no context to provide clues. For the same reason, however, Power Spelling seems a bit less educational than the other modes; there is no motivation to learn the meanings of the words.

The third mode is aptly named Do It Yourself and invites you to enter your own list of up to 20 words. The instructions for Do It Yourself are provided on the screen and should present no problem for even the computer novice.

The documentation suggests entering your spelling list or making your own "fill in the blanks" game.

Documentation

The instruction manual is an attractive, 32-page booklet that includes the simple instructions and 30 of Gabdoc's Notes Home. There are no educational objectives, and only one paragraph suggests different ways to use the program.

Included in the hard plastic binder is a reference card that lists loading instructions, defines important keys, and reminds you how to accomplish the most important actions required by the game. Also included are a *Spelldiver* poster, six stickers—three of Oshianna and three of the flipper-nipper—and a "sketch pad" which is just a sheet of glossy paper with a grid printed on it. You are advised to draw the uncovered letter parts on the grid with a grease pencil, but none of our playtesters found it necessary to do so.

Spelldiver is a simple, well executed game that should help children learn to recognize letters and spell words of various difficulty.

Summary

Spelldiver is a simple, well executed game that should help children learn to recognize letters and spell words of varying difficulty. Identifying the words in context is of even greater value since it encourages vocabulary development, and we applaud the authors for couching the missing words in a clever and challenging format.

CIRCLE 407 ON READER SERVICE CARD

SOFTWARE PROFILE

Name: Spelldiver
Type: Educational game
Suggested Age: 6 and up
Author: Gabrielle M. Savage and Thomas F.F. Snyder
System: 48K Atari 800, C-64; joystick
Format: Disk
Summary: Simple, well executed letter/word recognition game.
Price: $29.95
Manufacturer:
Scholastic Inc.
1290 Wall Street West
P.O. Box 641
Lyndhurst, N.J. 07071
(201) 939-8050

Attack of the Spelling Bees

From a product of education giant Scholastic, we move to a package produced by the Jay Gee Programming Company, a small company in San Jose, CA. *Attack of the Spelling Bees* comes in a simple cardboard envelope with unpretentious documentation. The disk label is printed on a dot matrix printer, and the disk itself is unadorned by even the simplest envelope.

As we have said before, however, you can't judge a program by its packaging —or even the lack of it: *Attack of the Spelling Bees* is a great educational game.

The only bad part of the game is trying to explain it, so let's take it slowly. The playfield is the entire screen around the four edges of which appear large letters in three colors, red, blue, and white. Inside the letter border are two bee-shaped tokens, one blue and one red.

The game can be played by one or two players. If one person plays, only one bee is active, although the other remains on the screen causing a bit of a roadblock since the player can't move past or over him. In the two-player game, both bees are active, but still cannot move over or around their opponents.

As play begins on the beginner level, two-, three- and four-letter words travel slowly across the screen. Each word has an asterisk (flowers the documentation calls them) in place of one missing letter.

Your task is to figure out the correct spelling of each word and complete it using the letters that border the screen. To do this, you position your bee next to the letter you want to insert and press the fire button when the word is in range. This is not as easy as it sounds.

The first complication is that you can use only letters that match the color of your bee or the white letters, which are available to both players. The second difficulty is that periodically, the border letters change position slightly. How frustrating it is to wait patiently by a letter for the appropriate word to cross your firing path only to have the letter move just as you press the trigger!

Nor can you be certain that the letters needed to fill in the words currently on the screen are available. When you shoot, the letter you have shot disappears to be replaced by another that is selected at random. If there are no useful letters in your border, you must fire just to eliminate some and hope that the replacements will be better.

Another hurdle is that there may be more than one correct way to complete a given word. Ca__e, for example, could be cake, cane, cape, or any of several other words, and it is up to you to guess which consonant the author has in mind. For any word that is not completed in

SOFTWARE PROFILE

Name: Attack of the Spelling Bees
Type: Educational game
Suggested Age: 6 and up
System: 32K Atari
Format: Disk
Summary: Addictive spelling game for all ages
Price: $39.95
Manufacturer:
The Jay Gee Programming Company
7185 Blue Hill Dr.
San Jose, CA 95129
(800) 227-1617 ext. 217 (nationwide)
(800) 772-2545 ext. 217 (in CA)

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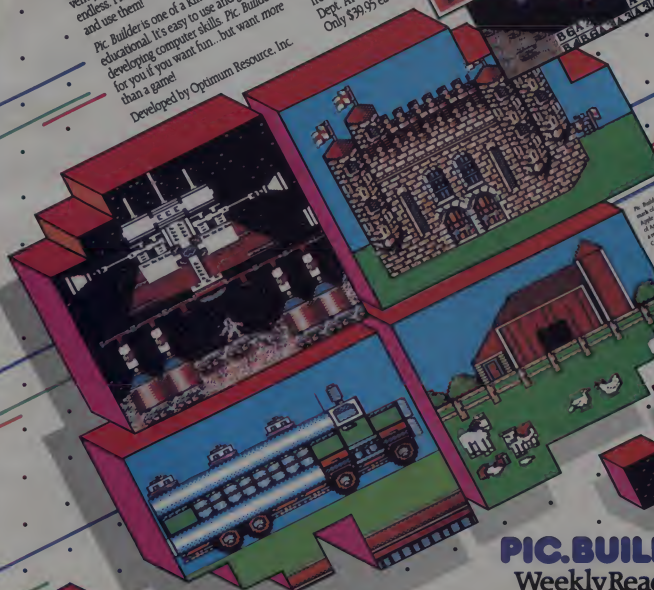

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CIRCLE 181 ON READER SERVICE CARD

Attack of the Spelling Bees

The Word Bird

about two minutes, the correct spelling will flash a few times, giving you a few seconds to complete it. If you still don't get it right, the word disappears, but "will probably come back later to haunt you with even more letters missing."

You control your bee with the joystick, pressing the stick forward to go clockwise and back to move counterclockwise. This takes some getting used to, but get used to it we did and were soon zooming around the screen.

As the game progresses, the difficulty gradually increases based on the number of correctly spelled words. More difficult games offer words of up to 15 letters with more than one letter missing from each. The speed of the game is also increased if you select the intermediate or advanced level of play.

At the beginning of each session, you specify the duration of the game (from 1 to 30 minutes), and scoring is based on the number of words completed with variations that are too complicated to explain here (a scoring table is provided). The five high scores are saved on disk along with the player's initials and updated at the end of each game.

Documentation

As mentioned above, we found this a difficult game to describe, and apparently the author faced the same problem when writing the documentation. You can get the general idea of the game from reading the six-page instruction leaflet, but it is not until you have played several games that you really understand it. You can then refer back to the leaflet for scoring details and other fine points.

The documentation is clear, however, about what and how it hopes to teach. The first paragraph states that the game "teaches spelling in two ways; directly, by requiring the player to fill in missing letters in words, and indirectly by impressing the images of correctly spelled words on the player." We think that both of these objectives are met, and are exceedingly happy to note that at no time does an incorrectly spelled word appear on the screen.

The leaflet notes that the game disk contains 250 common words. There is no provision for adding your own words, but additional word lists for all grade levels and in various specialized categories are available at modest cost from the manufacturer.

Summary

We found *Attack of the Spelling Bees* addictive in a way that few educational programs are. The concept is simple enough, but the challenge of figuring out first which letter to use and then successfully hitting the target with it make the game great fun. The two-player game can turn friends and colleagues into cutthroat adversaries as it demands not only quick thinking to get a word before your opponent does but a certain amount of strategy as you use your bee to keep the enemy from using the letters he wants.

We found Attack of the Spelling Bees addictive in a way that few educational programs are.

Our only suggestion for Jay Gee concerns the packaging of the program. We think that it would be well worth the small extra cost to provide an envelope for the disk. We think this is an excellent package for classroom as well as home use and one that will see a great deal of use in either environment. We fear for the life of an unprotected disk and think that for $39.95 you should get a 5¢ envelope along with the disk.

CIRCLE 408 ON READER SERVICE CARD

The Word Bird

Moving from the bees to the birds, we examined a new package in the Diskovery Reading Works series from International Publishing and Software, a Canadian company. The bird pictured on the box of *The Word Bird* has a balloon filled with prepositions—on, in, beside, above—coming out of its mouth. It reminded us of our high school German teacher stalking around the room chanting "*an, auf, hinter, in, neben, über, unter . . .*"

Yes, Fräulein Behrens had one way of teaching prepositions, and it was effective, but times have changed. Children learning about prepositions in English today have a far more pleasant vehicle. *The Word Bird* is a delightful program that "focuses on the relationships between objects in space and the way these are described in English."

The disk includes three activities of increasing complexity which are chosen from the title screen by pressing the 1, 2, or 3 key. All other action required of the player is executed either with the joystick or a strange set of keys. The keyboard control combination of left arrow (down), CTRL (left), 1 (up), and 2 (right), which did not correspond with the diagram in the documentation booklet, is one of the least logical we have seen, and we found that players had a much easier time with and preferred to use the joystick.

After a short practice session in which

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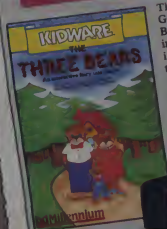
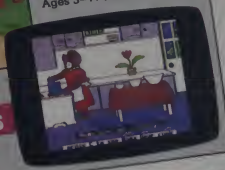


The classic fairy-tale of Goldilocks and the Three Bears comes to life in new interactive form. The graphics are bold and bright and the story unfolds as your child directs. Like a picture book, a tale for you and your child to read and share together. By Gladys J. Reich and Laura Boxer. Illustrated by A. Barbara Jurgensen. Ages 3–7. $39.95.



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A challenging memory testing and building game for the entire family. Five separate games—balloon games for the youngest child, flag matching for the entire family, and Morse code for the hardest Concentration ever. And with varying levels of difficulty, everyone can play. By Gladys J. Reich, Laura Boxer, and Ronald S. Lizzi. Ages 5–adult. $34.95.

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212A Modem Comparison Chart *

STANDARD FEATURES	PRO	HAYES STACK	NOVATION SMARTCAT	ANCHOR 1200	US ROBOTICS PASSWORD
300/1200 Baud (212A)	✓	✓	✓	✓	✓
Intelligent Microprocessor	✓	✓	✓	✓	✓
Tone and Pulse Dialing	✓	✓	✓	✓	✓
Hayes Command Compatible (Works with Smartcom™)	✓	✓		✓	✓
Additional telephone jack with exclusion switching	✓		✓	✓	
Analog loop back self test	✓	✓	✓		
Self Test at Power Up	✓				
Call Progress Detection (Busy, Dial Tones, Trunk Busy, etc.)	✓		✓		
Speaker and External Volume Control	✓	✓	✓		
Full Complement of Status Lights	✓	✓	✓		
8 Switch Selectable power-up defaults	✓	✓			
Adaptive Dialing	✓				
Auto Redial on Busy	✓				
Ergonomically designed easy to read front display panel	✓				
Internal Stand-Alone Power Supply	✓				
Built in Real Time Clock/Calendar	✓				
Help Command	✓				
300 baud connect while maintaining 1200 baud RS-232 link	✓				

EXPANDABLE OPTIONS	PRO
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Automatic Transmit Buffer	✓
On-board Personal/Business Directory	✓
Buffer, Expandable to 64K	✓
Auto Logon Macros	✓
Auto message transmission to groups of numbers	✓
Records call duration	✓
12-character Alphanumeric Display	✓

*Comparison made by Prometheus on the basis of the best information available to Prometheus at time of printing.

CIRCLE 156 ON READER SERVICE CARD

you master the technique of moving a rectangular frame around on the screen and positioning it over a word to indicate a choice, you begin with Activity 1 which asks you to compare a sentence to a picture on the screen and tell whether the sentence is true or not. You may see a picture of a castle with a road leading up to it. As you watch, a snake moves across the screen and stops alongside the road. The sentence under the picture reads "The road is to the right of the snake." You use the joystick to move the frame over the word "yes" or "no" to indicate your answer.

During play, the program selects randomly from a pool of five prepositions. When you have answered correctly with a given preposition three times, that word is removed from the pool and another is substituted. A total of 12 prepositions is drilled in Activity 1. The activity ends with a screen that reports the number of correct answers out of the number of attempts. The program then cycles back to the title screen to allow you to choose one of the other activities.

In Activity 2, a picture is presented. Then an additional object floats across the screen, coming to rest near something in the picture. You read the sentence below and decide which of two or three prepositions when inserted into the sentence will make it correct. For example, you may see an outdoor scene with a bird peeking out of a mailbox. You must then decide whether "inside" or "on top of" makes the sentence "The bird is the mailbox" describe the picture. You must get each preposition right five times in a row to advance in Activity 2.

The Word Bird is a unique program that drills several valuable skills at once.

When you choose a correct answer in either of the first two activities, you hear a pleasant tune. A pencil then appears in the lower right corner of the screen and draws a red check mark. Finally, the message "That's right!" appears under the sentence. Incorrect responses evoke a "raspberry" sound, and the pencil draws an X. A sentence of explanation then appears on the screen.

Activity 3 asks you to make your own sentences. A picture is presented along with a skeleton sentence containing three blanks. Beneath each of the blanks are two words or sets of words that can be used to complete the sentence. You choose one from each pair and watch as the scene ("The boat is on top of the bird," for example) is created on the screen. We found that the sillier the sentences, the more our playtesters enjoyed the game.

SOFTWARE PROFILE

Name: The Word Bird
Type: Educational game
Suggested Age: 6 to 12
Author: Jill Golick
System: 32K Atari, Commodore 64
Format: Disk
Summary: A superb way to practice reading and spatial relationships.
Price: $29.95
Manufacturer:
International Publishing & Software Inc.
3948 Chesswood Dr.
Downsview, ON
Canada M3J 2W6
(416) 636-9404
Distributor:
Gladstone Electronics Inc
1585 Kenmore Ave.
Buffalo, NY 14217
(716) 874-5510

Documentation

The eight-page instruction booklet is a model of completeness. It begins by describing the rationale for learning the skills presented in the game: "Although our world is three-dimensional, we usually use only two dimensions to represent it . . . and to understand geometry, trigonometry, and geography, children must be able to recognize spatial relationships."

The next section describes the use of the joystick and control keys, and instructions for loading the program to follow. Unfortunately, there is a typographical error in the loading instructions for the Commodore 64, so a strip of paper detailing the correct command is inserted in the package. Although it is a standard command, this is a bad sort of error to find in an instruction manual.

The activities are described in a page and a half, followed by a page of suggestions for reinforcing the skills practiced in the activities—both with the computer and without. On the last page of the booklet we find a set of educational objectives that would satisfy any education professor. And we think that the program does an excellent job of satisfying those objectives.

Summary

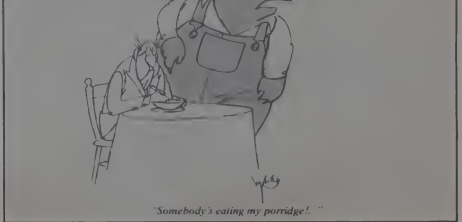
The Word Bird is a unique program that drills several valuable skills at once. It teaches spatial relationships while encouraging the young reader to read carefully (even our adult players made errors when they overlooked the word "not" in some of the sentences or failed to concentrate on word order).

The graphics are colorful and clever, and the vocabulary is varied enough to assure that children will not soon tire of it.

Our only complaints concern the two typos (loading instructions and control keys) in the manual. These can be corrected easily, and we hope they will be in subsequent editions of the program.

The Word Bird is a truly superb example of what educational software can be. We recommend it highly.

CIRCLE 409 ON READER SERVICE CARD

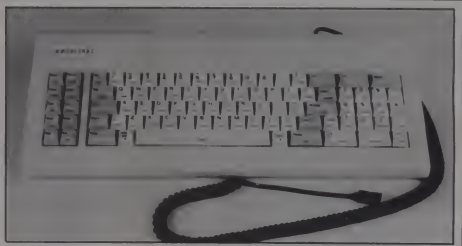


"Somebody's eating my porridge!"

What's New In **Hardware**

Detachable Keyboard for Apple

Data Spec has released a detached extension keyboard for the Apple II/II+. The keyboard features a full ASCII character set with upper- and lowercase. To simplify computer use, the keyboard has a total of 97 pre-programmed functions and commands, 20 of which are located on a separate keypad for easy access. All four mathematical functions are found next to a ten-key numeric keypad. In addition, key words such as FOR, NEXT, and PRINT; and operating system commands such as DIR, PIP, TYPE, and STAT; and other key words used in programming are included.



The Data Spec keyboard includes a ten-foot coiled cable for accessibility and freedom of movement. The suggested list price is $299.95.

Alliance Research Corporation, 18215 Parthenia St., Northridge, CA 91325. (818) 701-5848.

CIRCLE 410 ON READER SERVICE CARD

Modem and Winchester for Mac

Tecmar has implemented a telephone/modem subsystem for Macintosh and other computers with RS-232 serial ports that provides an easy-to-use, low cost, full-featured telephone and modem interface. It can be used as a standard telephone

TECMAR

with a handset or be connected to a telephone.

The product is a 300/1200 baud (212 A compatible) modem with touch-tone decoding, pulse/tone automatic dialer, and a full voice interface. It can be used to enter data or commands remotely through the standard keypad of a telephone.

Called Apple Fritter, the peripheral, when configured for the Applebus, is part of Tecmar's Candy Apple line of interfaces for Macintosh and other Applebus peripherals.

Macintosh 5 MByte Cartridge Winchester

Also for the Macintosh is Tecmar's 5Mb Removable Cartridge Winchester Subsystem called The Mac Drive.

The Removable Cartridge Winchester combines the mass storage and speed of conventional Winchesters with the removability, transportability, and flexibility of a floppy. Tecmar has interfaced the removable cartridge Winchesters to the Applebus for use with Macintosh. It is provided in an enclosure that fits the Macintosh style and color.

Tecmar, Inc., 6225 Cochran Rd., Solon, OH 44139. (216) 349-0600.

CIRCLE 411 ON READER SERVICE CARD

Apple Software Runs on IBM

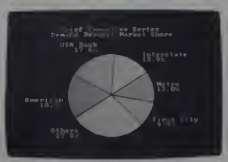
The Diamond 3 is a plug-in board that lets users of the IBM PC run both Apple and CP/M programs.

Developed by Diamond Computer Systems, the Diamond 3 is a sophisticated microcomputer. It has three processors, a Z80A for CP/M, a 6502B for Apple mode, and a separate 6502B display controller with software that improves on the quality of Apple II screen output through interface scanning.

The Diamond 3 is available, at a suggested retail price of $695.

Diamond Computer Systems, Inc., 3380 Montgomery St., Santa Clara, CA 95050. (408) 986-0100.

CIRCLE 412 ON READER SERVICE CARD



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Amdek Daisywheel Printers

Three new letter quality printers, the 5000 series, for home, office, and other commercial environments have been introduced by Amdek Corporation.

The Amdek 5000 series includes:

- The Amdek 5025, a transportable, 25 cps printer.
- The Amdek 5040, a desktop, 40 cps printer.
- The Amdek 5055, a desktop, 55 cps printer.

The 5000 series printers are ruggedly built and operate at a low, 50 dba noise level.

The printers have built-in Centronics parallel and RS-232 serial interfaces allowing the units to be compatible with a wide range of computers.

The printers have a wide paper carriage to handle 132-column forms for spreadsheet applications and use a newly designed daisywheel that provides up to 125 characters per wheel.

Each printer is shipped with a daisywheel, ribbon cassette cartridge, parallel interface cable, paper guide, and full documentation.

The suggested retail price of the Amdek 5025 is $799; the Amdek 5040, $1675; and the Amdek 5055, $1990.

Amdek Corporation, Printer Products, 2201 Lively Blvd., Elk Grove Village, IL 60007. (312) 364-1180.

CIRCLE 413 ON READER SERVICE CARD

Music Cards for Apple

ALF music cards for the Apple are now available with new software. Both the nine-voice Music Card MC1 ($169) and the three-voice Music Card MC16 ($179) now have extensive editing functions which make it even easier for novices to enter songs and play them back. The user can create music without having to learn to play an instrument by matching the symbols in regular sheet music with those on the screen.

New playback routines allow the tempo to be changed at any point and allow several songs to be played in sequence. A program for experimenting with sound envelopes and creating loudness contours is now included.

The MC1 and MC16 cards can be used on the Apple II/II+/IIe and Apple-compatible computers. Present MC1 and MC16 owners can obtain upgrades at a nominal cost.

ALF Products Inc., 1315-F Nelson St., Denver, CO 80215. (303) 234-0781.

CIRCLE 414 ON READER SERVICE CARD

Intelligent Printer Interface for C-64

Orange Micro, Inc. announces the Grappler CD intelligent printer interface for the Commodore 64. Featuring four different operating modes, the Grappler CD is the most complete interface available. The Grappler CD contains a Commodore 1525 Emulation Mode which causes the printer to create characters as they would appear on the C-1525 printer. This means graphics and special characters can now be printed by Epson, Star, Okidata, Prowriter, NEC, and other dot matrix printers. It also provides universal software compatibility, as most Commodore programs will send C-1525 codes.

The screen dump routines allow the printing of hi-res and block graphics with a variety of options. Double size, inverted, rotated, and emphasized graphics are accessible via simple commands.

The Grappler CD comes in a sturdy housing with all required cables included. Power is drawn from the expansion port to eliminate extra wiring.

Orange Micro, Inc. 1400 N. Lakeview, Anaheim, CA 92807. (714) 779-2772.

CIRCLE 415 ON READER SERVICE CARD

Portable Conversion System for IBM

Colby Computer offers three conversion systems to enable owners of IBM PCs to turn their existing desktop PC's into transportable PC computers. The PC-1 is a low-cost way to achieve a 100% IBM PC compatible system; the system uses the motherboard, plug-in boards, disk drive, and keyboard from the IBM PC. The rugged aluminum case features a carrying handle and tilt stand. No soldering is required; a screwdriver is all that is needed.

The PC-1 system includes an amber 9" high-resolution display, power supply, case, and all cables and interface boards.

The PC-2 system includes the above equipment plus an IBM-compatible keyboard which attaches to the front of the unit for portability.

A PC-2.2 system includes the above plus two half-height disk drives and lists for $1895.

The PC-1 system retails for $899; the PC-2 system, for $1188.

Colby Computer, 849 Independence Ave., Mountain View, CA 94043. (415) 968-1410.

CIRCLE 418 ON READER SERVICE CARD

Apple Computer-based Multi-Image Slide Shows

Photographers can now use their Apple computers to prepare slide shows. Pacific Micro Systems, Inc. has introduced the Apple/Gemini multi-image programming system which consists of three basic components: a peripheral card for the Apple II/II+/IIe, slide show editing software, and the Gemini 2002 controller for two slide projectors.

The Apple/Gemini system creates shows for two to six Kodak 35mm projectors, using professional fade in/fade out dissolve techniques. The dark interval between slides is eliminated as images blend into each other. All slide show commands can be recorded on one channel of a stereo tape recorder leaving the other channel for narration and music. Slide/tape synchronization is assured by digital codes recorded on tape.

Special effects include superimpose, slide random access, animate, flash, fade to black, and home to first slide. Thirty-two fade times are available. The list price of the Gemini 2002 is $479.

Pacific Micro Systems, Inc., 160 Gate 5 Rd., Sausalito, CA 94965. (415) 331-2525.

CIRCLE 417 ON READER SERVICE CARD

COMPUTERS FOR KIDS!

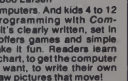
COMPUTERS FOR KIDS!

By Sally Greenwood Larsen

Children love computers. And kids 4 to 12 love to learn programming with *Computers for Kids*. It's clearly written, set in large type and offers games and simple programs to make it fun. Readers learn how to do a flowchart, to get the computer to do what they want, to write their own games—even draw pictures that move!

Even if you've had no experience teaching microcomputer programming—or doing it yourself—*Computers for Kids* makes it simple. Included is a section of notes for teachers and parents, suggested lesson outlines, teaching suggestions for each section, and a glossary.

Sally Greenwood Larsen's extensive experience teaching microcomputer programming to kids makes this one of the best elementary books on the subject. Seven different editions!



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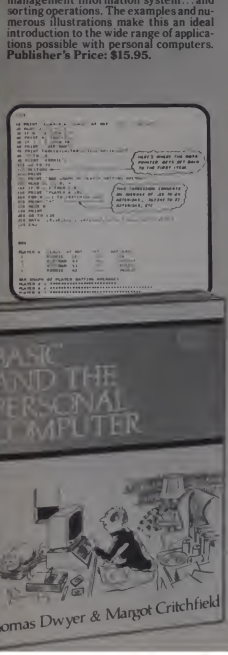
The book shows how to make use of BASIC in simple tasks like computerizing your record library... putting together a management information system... and sorting operations. The examples and numerous illustrations make this an ideal introduction to the wide range of applications possible with personal computers. **Publisher's Price: $15.95.**



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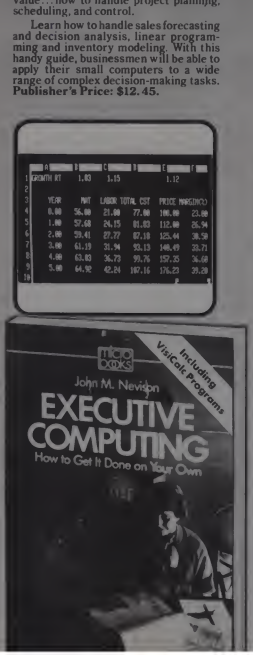

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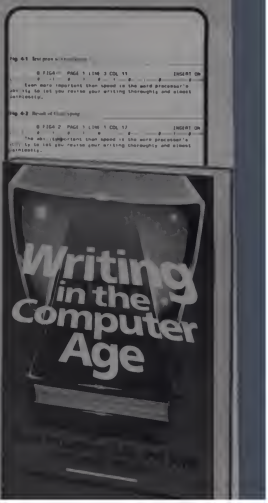
Learn everything from moving the cursor to allocating disk space for data base research. **Publisher's Price: $10.95.**



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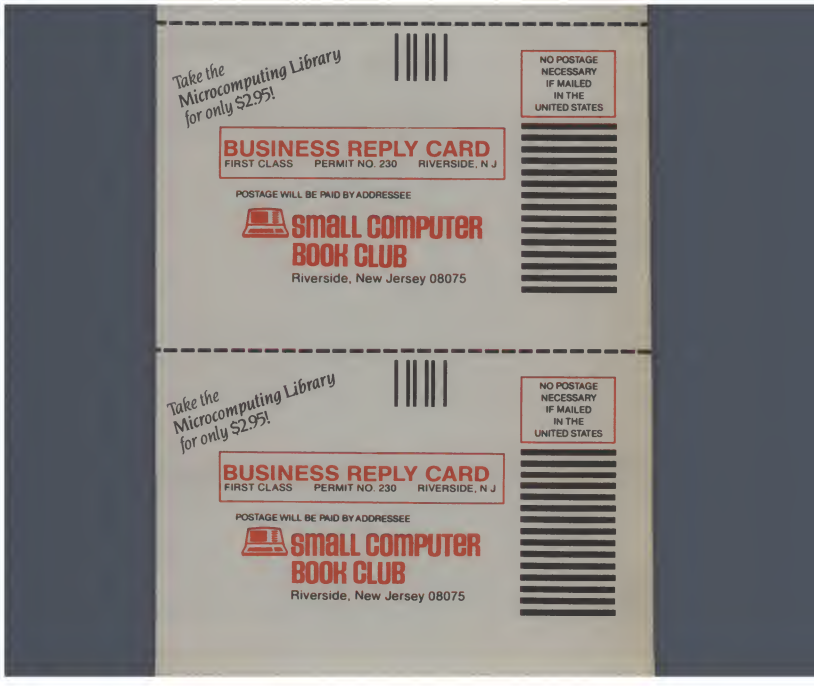
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Roy E. Myers. This sophisticated computer graphics book for BASIC programmers provides the essential mathematics and programming techniques you will need for computer graphics applications.

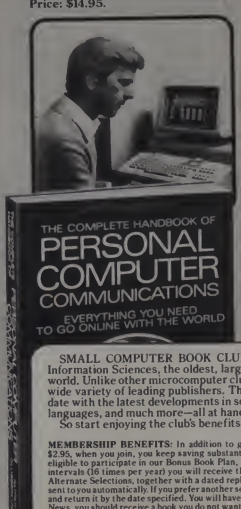
The programs are written in Applesoft BASIC, but many are adaptable to other languages and microcomputers. This excellent guide shows you more than 80 ready-to-use BASIC programs which illustrate basic graphics concepts ...shows you how to create your own graphics...includes techniques for generating three-dimensional graphics in two dimensions...shows you hidden line and surface routines...introduces animation techniques...and shows you how to handle image rotation and translation.

It includes an overview of all the system components needed to do graphics work. **Publisher's Price: $12.45.**

5 The Complete Handbook of Personal Computer Communications.

Alfred Glossbrenner. Here is a remarkable collection of detailed information on the far-flung aspects of computer networking and data bases—*information for which the average person would have to spend at least a year and probably more than a thousand dollars.* You'll find thousands of ways you can use your personal computer to find specialized business information...do shopping and banking at home...and more.

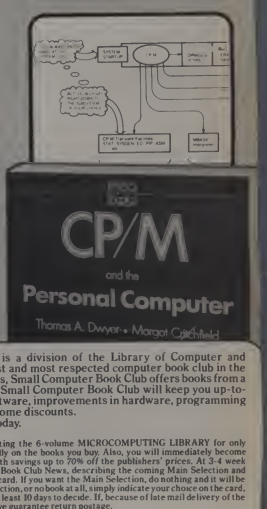
The book points out the hardware you will need, and covers such important topics and services as time-sharing networks...direct and acoustical connections...modems...what to look for when selecting communications software... and how to use the specialized data bases, such as Newsnet and Comp-U-Store which are already available. **Publisher's Price: $14.95.**



6 CP/M and the Personal Computer.

Dwyer and Critchfield. The authors of this outstanding guide show you how to get the most from CP/M ...how to use the basic system commands that will allow you to manage disk storage...debug other programs...move programs and data from one location to another...cold and warm booting ...formatting blank disks...how CP/M itself is organized.

The authors also tell you how to deal with just those areas which the CP/M manuals fail to explain well, including the three main command modules of CP/M ...the seven built-in commands...nine transient commands...the six principal control characters. Then they show how to use the typical features of software packages that run under CP/M, including word processing...business accounting systems...data base management systems...electronic spread sheets/plotting/predicting packages...and much more. **Publisher's Price: $19.95.**



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Apple II Forever?

Apple Announces the IIc

George A. Miller

On April 24, 1984 Apple Computer made an earthshaking announcement: the Apple IIc. The Moscone Center in San Francisco shook for nearly three minutes with the force of 6.2 on the Richter scale. The occasion for the announcement was a combined dealer/sales convention for Apple. The theme of the convention was "Apple II Forever," which neatly summarizes Apple's long range strategic plan for the Apple II.

The Apple IIc contains a 65C02 CPU operating at 1.02 MHz—essentially a low heat version of the processor used in all Apple IIs. It contains 128K of RAM and 16K of ROM, which includes Applesoft Basic. A 5 1/4" disk drive is built into the unit along with a full-function keyboard. The power transformer has been removed from the main unit and attached to the power cord. This allows the Apple IIc to run off of an AC outlet, a car cigarette lighter, or a battery pack. The unit has a slim design, is ivory in color, and weighs only 7 1/2 pounds. The little handle on the back is most useful for propping the unit up for a proper keyboard angle. It is only marginally useful for toting the unit since you also need to tote the power cord, disks, and the RF modulator in hopes of tracking down a TV set to plug into.

The rear panel contains a potpourri of sockets which lets the Apple IIc neatly communicate with the outside world. There are sockets for a display screen, a printer, a modem, a mouse, a joystick, and a second floppy disk drive. In keeping with Apple's international outlook, each socket is labelled with an icon which identifies the function of the socket. A built-in speaker allows five octaves of sound.

The Apple IIc offers three graphics modes: 16-color low resolution (40 by 48), six-color high resolution (280 by 192), and monochrome ultra-high resolution (560 by 192).

The keyboard is really nice. The keys are full-stroke and have an audible click. Upper- and lowercase are available, and there is a tiny switch at the top of the keyboard to allow you to switch from 40 columns to 80 columns. Next to that switch is another one used to change the keyboard from QWERTY to Dvorak. On the international versions of the Apple IIc the keyboard switch will allow instant flip from your country keyboard layout to American.

The Apple IIc sells for $1295. Accessories include a printer, mouse, monitor, monitor stand, carrying case, second power pack, and disk drive. The printer is called the Apple Scribe thermal-transfer printer. It costs $299 and is capable of high-quality text and graphics in black and white or color. If you get the color ribbon, you can print in cyan, magenta, and yellow. By careful control of adjacent colors you can create combinations of these colors. Clever software should permit a whole rainbow of output.

The mouse sells for $99 and is the same mouse as comes with the Macintosh. In fact, free with your purchase of the mouse is a program called *Mousepaint*, which bears a strong resemblance to MacPaint. The monitor is a very small, green phosphor screen which sells for $199; the stand for $39. The carrying case costs $39, and the external drive, $329. Apple's Imagewriter can also be connected to the IIc. Perhaps most interesting was the announcement of a future accessory called the flat display. This is a full 80-column by 24-row, low power LCD display is scheduled to be released in the fall and will sell for $600. With this display and the battery pack, the Apple IIc may actually achieve portability.

Enough of the facts. Now for some editorial comment and speculation: It is clear that the Apple IIc is a direct attack on the IBM PCjr. The two machines sitting side-by-side look very much alike. They both have 128K memory, one disk drive, an external power pack, and basically the same back panel of sockets. They are basically the same price, and both claim heritage of their family line of software. The keyboard on the Apple IIc is much better than the IBM PCjr. The CPU on the PCjr is much larger and faster than the one on the Apple. The Apple IIc will be able to run on a battery; the IBM PCjr was not designed to be battery driven. You can attach a mouse to either. The IBM PCjr allows bus expansion out the side and ROM cartridges in the front. This war will have no clear winner. Apple fans will buy the Apple IIc, and IBM fans will buy the PCjr.

I believe the Apple II will live forever. There is enough momentum to let it coast to the age at which it will become a museum piece. The Apple IIc has got to be the final transmutation of the Apple II for the following reasons: The Apple II requires a 5 1/4" disk drive for compatibility with its base of 10,000 programs. The Apple IIc is about as small a package one can design with a full-function keyboard and a 5 1/4" disk drive.

Apple has staked out a very bright future with its Lisa/Macintosh and will start devoting more of its energies to the 68000 chip and the 3 1/2" disk drive. The Macintosh is a revolutionary machine. The Apple IIc is evolutionary and the final (I believe) installment in the Apple II line.

Apple claims that 90 percent of the 10,000 Apple II programs will run on the Apple IIc. 10,000 programs should not be sneezed at; however, how many of them are really useful? Software becomes obsolete, just as hardware does. You can use only one word processor at a time, yet there are dozens for the Apple II. The newest wrinkle in "user-friendliness" is the mouse. How many of these 10,000 programs use the mouse?

These observations notwithstanding, Apple has made a very strong move with the Apple IIc and its marketing of it. I am convinced of the long term viability of Apple as the computer company of choice.

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What made over 100,000 Apple II owners fall in love with System Saver?

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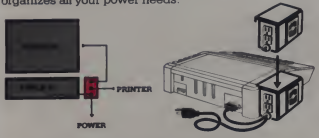

It functions as a multi-outlet power strip with two switched outlets. Plus System Saver offers the ultimate convenience; a front mounted power switch for fingertip control of your entire system.

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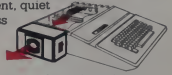
Today's advanced peripheral cards generate heat. In addition, the cards block any natural air flow through the Apple IIe creating high temperature conditions that shorten the life of the Apple and peripheral cards.

System Saver's efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots. It leaves your Apple cool, calm and running at top speed.



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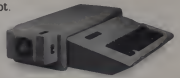

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CIRCLE 140 ON READER SERVICE CARD

Your Apple's telephone.

Hayes™

"Thanks for the prompt reply. Sure was a lot faster than waiting for the mail!"

"Gary: The pedigrees for next week's auction are as follows..."

"Attn. Prod., Sales, Purch.: Recommend 50% blue, 30% red screen for closest match."

A complete plug-in communications system for Apple® computers. From Hayes, the established telecomputing leader: the simple but sophisticated Micromodem IIe® plug-in board modem and its companion software, Smartcom I.™ Everything you need to expand the world of your Apple II, IIe, II Plus and Apple III. In one, convenient communications package.

With Micromodem IIe and Smartcom I, you can access data bases, bulletin boards, and the varied resources of information services. Plan your travel itinerary via computer, including flight numbers, hotel and rental car reservations. Retrieve and analyze daily stock and options prices. Work at home and send reports to your office. You can even do your gift shopping by computer!

Micromodem IIe. Think of it as your Apple's telephone. It allows your computer to communicate with any Bell-103 type modem over ordinary telephone lines, at 110 or 300 bits per second. Micromodem IIe installs easily in an expansion slot, and requires no outside power source. It connects directly to either a single or multiline modular phone jack, to perform both Touch-Tone® and pulse dialing.

Micromodem IIe dials, answers and disconnects calls automatically. And, unlike some modems, it operates in full or half duplex, for compatibility with most time-sharing systems.

A built-in speaker lets you monitor your calls when dialing. That way, you'll know if a line is busy. With Smartcom I, Micromodem IIe automatically redials your last number.

Discover how Micromodem IIe can help maximize the capabilities of your Apple. While Smartcom I software will minimize your efforts.

Micromodem IIe
Smartcom I

Smartcom I companion software. For effortless communications. Whether you're a newcomer to personal computing or a seasoned professional, you'll appreciate the ease and speed with which you can perform any communications function. Thanks to Smartcom I!

Let Smartcom I guide you through a few easy-to-answer questions to tailor the program to your particular needs. Then you're ready to go!

Make a selection from the Smartcom I menu to manage your communications, files or printer. Program prompts guide you along the way. And menu selections let you easily make a call, end a call, or answer a call. When you're on the receiving end, your Micromodem IIe answers automatically, even if you're not there!

Convenient! And so is the Smartcom I memory for phone numbers. Smartcom I stores three of your most frequently called telephone numbers and one prefix. Plus, it also remembers the last number dialed.

Smartcom I also provides a directory of the files stored on your disk. And lets you create, list, name, send, receive, print or erase files right from its menu.

Smartcom I is as versatile as you need it to be. It accepts DOS 3.3, Pascal, CP/M™ 3.0 or CP/M Plus™ operating systems. And accommodates up to six disk drives and several printer interface cards.

Like all our products, Smartcom I and Micromodem IIe are backed by excellent documentation and full support. Including a two-year limited warranty on Micromodem IIe and a 90-day warranty on Smartcom I!

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What's New In **Software**

Language Learning on Apple and IBM

Lamplighter Software, Inc. has introduced *Language Lab*, a complete foreign language training system for Apple and IBM Personal Computers. Unlike computerized vocabulary builders, the *Language Lab* systems teaches all skills necessary for fluency in a foreign language. The program offers computer-assisted study, self-quizzing, and an interactive audio cassette for pronunciation.

Included with the software is an interactive cassette adapter, which does away with the need to locate and play back pronunciation lessons manually on a cassette player. It automatically stops and starts the student's cassette player in coordination with the lessons presented on the display.

Language Lab is available for the Apple II/II+/IIe and the IBM PC and PCjr. It requires 64K RAM, one disk drive, and a cassette player. *Language Lab* is available in Spanish, French, and German, and is priced at $235 per language.

Lamplighter Software, Inc., 7 Breton Ave., Melville, NY 11747. (516) 421-2653.

CIRCLE 420 ON READER SERVICE CARD

Data Management System from Hayes

Hayes Microcomputer Products Inc. has released *Please*, a fast, easy-to-use data management system for the IBM PC that makes it easy to organize information by simplifying data input and output.

The menu-driven software has 999 characters per field, 99 fields per record, 2000 characters per record, and several million per database, depending on the capability of the system.

Please offers speed and flexibility. Users can quickly change database structure, merge and copy databases, and transfer data.

Other features include:

- Import/Export—transfers data to and from almost any other source, including *Lotus 1-2-3, dBase II, VisiCalc*, and other popular software programs.
- Quick List—meets one-time needs by quickly retrieving selected information from a database according to specific criteria.
- Output Plans—List, Form, Replacement, Export—manipulate selected information to meet specific needs in printing and organizing data.
- Define—allows users to create new fields in the Output Plans based on other fields within the record. *Please* can be used with the IBM PC and compatibles. The software requires 128K RAM and two double-sided drives or a hard disk.

Please retails for $349.

Application templates sell for $29.95 each and include Mailing List, Membership, Applicants, Contacts, and Appointments. Others are also available.

Hayes Microcomputer Products, Inc., 5923 Peachtree Industrial Blvd., Norcross, GA 30092. (404) 449-8791.

CIRCLE 421 ON READER SERVICE CARD

Forth for the Apple

MasterForth, a complete professional programming language with a built-in macro-assembler, screen editor, and string handling package, is available from Micro-Motion. MasterForth meets all provisions of the new Forth-83 International Standard. Input/output streams are fully redirectable and make full use of the Apple DOS 3.3 file system.

The package includes Forth Tools, a 200-page textbook, a technical reference manual, and a complete listing of the MasterForth nucleus. Forth Tools is required reading for the UCLA and UC Berkeley extension courses on Forth. MasterForth packages retail for $100 to $160.

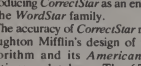
MicroMotion, 12077 Wilshire Blvd., #506, Los Angeles, CA 90025. (213) 821-4340.

CIRCLE 422 ON READER SERVICE CARD

Correct Star from MicroPro

MicroPro International Corporation of San Rafael and Boston-based Houghton Mifflin Company, a leading publisher and lexical authority, have pooled their talents to announce *CorrectStar*. MicroPro is introducing *CorrectStar* as an enhancement to the *WordStar* family.

The accuracy of *CorrectStar* results from Houghton Mifflin's design of the lexical algorithm and its *American Heritage Dictionary* database. The 65,000-word CorrectStar database consists of 99% of



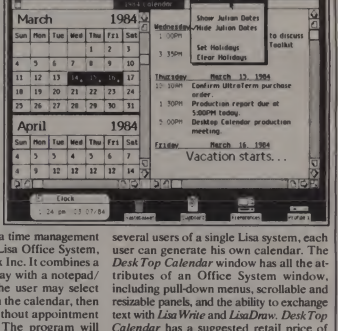
the most frequently used words in the English language as determined by frequency studies.

CorrectStar will become MicroPro's main spelling product in the 16-bit formats, but *SpellStar* continues as before in all 8-bit formats. However, as *CorrectStar* requires 192K of RAM, *SpellStar* will still be available as an alternative for computer systems with insufficient memory. The ~~suggested retail price of *CorrectStar* is~~ $195 and upgrades from *SpellStar* are available at a cost of $85.

MicroPro International Corporation, 33 San Pablo Ave., San Rafael, CA 94903. (415) 499-1200.

CIRCLE 423 ON READER SERVICE CARD

Time Management Software for Lisa



DeskTop Calendar, a time management software tool for the Lisa Office System, is available from Videx Inc. It combines a graphic calendar display with a notepad/appointment book. The user may select one or more days from the calendar, then enter notes, with or without appointment times, for each day. The program will also alert the user to appointments, even while another Office System tool is in use.

DeskTop Calendar is fully integrated into the Lisa Office System. If there are several users of a single Lisa system, each user can generate his own calendar. The *DeskTop Calendar* window has all the attributes of an Office System window, including pull-down menus, scrollable and resizable panels, and the ability to exchange text with *LisaWrite* and *LisaDraw*. *DeskTop Calendar* has a suggested retail price of $295.

Videx Inc., 1105 NE Circle Blvd., Corvallis, OR 97330. (503) 758-0521.

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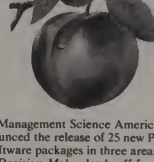
New Packages from Peachtree



Management Science America has announced the release of 25 new Peachtree Software packages in three areas.

Decision Maker leads off for personal productivity with the Peachtree "window" feature which permits the user to work on up to 20 projects at once (IBM PC, XT; $625 introductory). Seven new packages make up the Peachtree Home Software Library for home productivity (IBM PC, PCjr; $395). Joining the already established *PeachText 5000* in the office is *PeachPlan* for budgeting and forecasting (IBM PC and compatibles; $295).

In the accounting area *Fixed Assets* brings the Business Accounting System up to eight modules (MS-DOS, CP/M; $595 per module). Aiming at small businesses, Peachtree introduced its *Back to Basics Accounting System* with three modules, General Ledger, Accounts Receivable, Accounts Payable—Apple, Macintosh, Atari, C-64; $95 per module; $195 per set. IBM PC, PCjr; $295 per set.

The emphasis in the new products release was on the addition of an educational line with 16 new packages aimed primarily at Apple users (at this time) and mostly priced in the $39.95 to $49.95 range. Five programs use sound as a part of the learning experience: *Introduction to Poetry* and the four volume *Learning to Read Series* (speech synthesizer required). Also in the line are the *PSAT/SAT Analogies* program, a five volume *Writing Skills* series (also for IBM PC), and five games (*Merry Canned Nightmares and Dreams; Tranquility Base*; *Armageddon*; *Wilderness: A Survival Game*; and *Webster's Numbers*, for the young).

The new software announcements emphasize Peachtree's commitment to customer service through a toll-free number and upgrading support with information and special upgrade prices.

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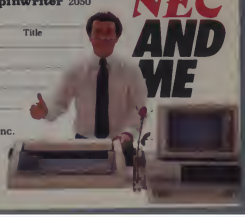

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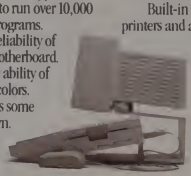

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CIRCLE 191 ON READER SERVICE CARD

Structured Programming In Basic

Part 3: An Application

Arthur Luehrmann

The first two articles in this series introduced the two main ideas of structured programming: (1) how to use the top-down method *of planning a whole program and (2) how to use three types of* formal control blocks *to handle all problems of program logic. This month's article shows how to apply these tools, in Basic, to an actual programming problem.*

The Problem

As pointed out in last month's article, the real payoff of using the tools of structured programming comes when you are faced with a big job. Small programming tasks usually yield to a brute force attack, but as the job gets bigger it gets disproportionately harder to get the program to work.

An hour or so of trial-and-error patching and debugging is multiplied into weeks or months when the number of program lines goes from 100 to 1000. Many programmers hit their "wall" on these long programs. Structured programming methods promise to change all that and bring the difficulty of the job back into proportion with the size of the program that will result.

Unfortunately, it is not practical in these few pages to present a truly big programming job and show how to solve it. That would take too much space and time. So, although we are forced to pick a smallish example for now, keep in mind that it is a stand-in for *any* programming problem you may face. The methods shown here are exactly the same ones to use on a program of 1000 lines or 5000 lines.

The programming example we have chosen is a simple word game. We want to have the computer play the game with a user of the program. Here is an informal description of the game as two people might play it together:

The game starts when Susan thinks of a secret word. After that, Bill tries again and again to guess the word. Each time, Susan tells Bill whether the secret word is earlier or later in the dictionary than the one Bill guessed. As soon as Bill guesses correctly, Susan says "You got it!" and the game ends.

Our goal will be to write a program that tells the computer precisely how to play Susan's part in the game. Though this task is simple enough to handle by almost any method, let's see how the structured approach works.

Top-Down Planning

The *wrong* thing to do at this point is to go to the computer and begin entering Basic statements. Instead, let's recall the steps of the top-down method of planning any program. Here they are:

1. Always start by planning a simple main routine. Use English phrases to describe the major tasks to be done. Avoid thinking about details.
2. Translate each English phrase into one or two Basic statements. If more are needed, use a GOSUB statement to refer to a subroutine that will contain the details.
3. Write skeleton versions of the subroutines, including PRINT statements for debugging. Run the program and check that things are done in the right order.
4. Fill in the details of each subroutine. Use these same four steps with each subroutine. If new, more detailed subroutines are created in the process, do the same four steps with them.
5. After the program is working according to the original plan, undertake any refinements you think necessary or desirable.

We begin with step 1: planning the main routine. A good starting point for such a plan is an ordinary outline written in English. Here is a possible way to describe the game in outline form:

1. Susan thinks of a secret word.
2. Bill guesses again and again, and Susan gives hints until he gets it right.
3. Susan congratulates him.

Now it is easy to see how to convert the steps of the outline into the main routine of our program. Here is the first stage of the conversion, partly in Basic and partly still in English:

```
100 PROGRAM GUESSING GAME
110     get secret word
120     guess words
130     wrap up game
140 END
```

Note that the outline gives no details. How does the computer get the secret word? How does the user guess words? How does the computer wrap up the game? At this stage, it makes no difference how the computer does these things. In fact, these details are exactly the wrong things to think about now. Details will come later, when we write the subroutines that tell the computer what these "top-level" instructions mean.

Now we go on to step 2 of the top-down method: converting the main routine completely into Basic statements. There are no simple Basic statements that you can substitute for the English phrases. That means we should use a GOSUB for each one:

```
100 'PROGRAM GUESSING GAME
110    GOSUB 200 'SECRET WORD
120    GOSUB 400 'GUESS WORDS
130    GOSUB 600 'WRAP UP
140  END
```

Note that we have used the apostrophe (') abbreviation for REM and :REM, as several current versions of Basic allow. To improve readability, we have indented the body of the main routine. In some versions of Basic, one must use colons to get indentation.

Now that the main routine is finished (and we will never return to it!), it is time to go on to step 3: writing skeleton subroutines, entering the program, and checking for errors. Each skeleton subroutine should have a PRINT statement saying which routine it is. The purpose here is to allow us to verify that the overall structure of the program is correct before going on. Here is the program with skeleton subroutines:

```
100 'PROGRAM GUESSING GAME
110    GOSUB 200   'SECRET WORD
120    GOSUB 400   'GUESS WORDS
130    GOSUB 600   'WRAP UP
140  END
190 '
200 'SUB SECRET WORD
210    PRINT "SECRET WORD SUBROUTINE"
380  RETURN
390 '
400 'SUB GUESS WORDS
410    PRINT "GUESS WORDS SUBROUTINE"
580  RETURN
590 '
600 'SUB WRAP UP
610    PRINT "WRAP UP SUBROUTINE"
780  RETURN
```

Now we have a complete Basic program that can be entered into the computer and run. It won't play the game yet, but as soon as the computer prints

```
SECRET WORD SUBROUTINE
GUESS WORDS SUBROUTINE
WRAP UP SUBROUTINE
```

we will be certain that the structure of the program is correct and that all the GOSUBS and RETURNS are in good working order. Then we will have a strong framework that will allow us to concentrate on each block of the program without worrying about the others.

Next we go on to step 4 of the top-down process: Filling in the details of each subroutine body. We begin with the SECRET WORD routine. What must it tell the computer to do? Remember that the purpose of this routine is to have the computer do what Susan did when she "thought of a secret word." Unfortunately, computers don't know many English words, so this part looks hard. We'll take the easy way out and have the computer ask someone other than the player to enter a secret word.

To fill in the body of the subroutine, we follow exactly the same rules we used for the main routine: (1) make an outline in English, (2) convert it to Basic, and (3) write more skeleton subroutines if necessary. Here is an outline version of SECRET WORD:

```
200 'SUB SECRET WORD
210    clear the screen
220    ask for secret word
230    input secret word
380  RETURN
```

Lines 200 and 380 are holdovers from the skeleton version. The next step is to replace each English phrase with one or two Basic statements to carry out the task described, or else to use a GOSUB to a new subroutine. Here is the result:

```
200 'SUB SECRET WORD
210    CLS
220    PRINT "WHAT'S THE SECRET WORD";
230    INPUT S$
380  RETURN
```

Line 210 might be different in different versions of Basic. In Applesoft, for example, the statement is spelled HOME. Note that each English phrase was easily convertible into one Basic statement, so no new GOSUBS were necessary.

Our goal will be to write a program that tells the computer precisely how to play Susan's part in the game.

The last step for this subroutine is to enter these new body statements into the computer and check for errors. Checking is best done in the immediate mode (if available) by typing GOSUB 200. If all is in order, the screen should be erased, the prompt message should be printed, and the computer should wait for input. Entering any word should cause a return from the subroutine. Then, entering PRINT S$ in immediate mode will confirm that the word was correctly assigned to S$.

Using Control Blocks

We can now turn to the GUESS WORDS subroutine, which is the heart of the entire program. Its job is to tell the computer to accept guess after guess from the user, give hints if the guess is wrong, and stop asking for more guesses if the guess is right. Obviously, there are many details to worry about here.

The trick is *not* to get bogged down in details. Instead, think about the *structure* of the problem. Recall how two people play the game. Once Susan thinks of a secret word, Bill guesses again and again, getting hints along the way, until he guesses the right word. What kind of program structure tells the computer to do something "again and again until" some condition becomes true?

If the answer doesn't jump to mind, remember the Boehm and Jacopini theorem from last month's article:

> **Theorem:** *Any* program logic, no matter how complex, can be resolved into only three kinds of blocks: *actions*, *loops*, and *branches*.

Action blocks are just straight sequences of action statements, such as INPUT, LET, and PRINT, which are to be performed one after the other. Loop blocks contain statements that are to be performed again and again until some *exit condition* becomes

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true. Branch blocks contain two groups of statements only one of which is to be performed.

Now we come back to our question: Which kind of program block will be needed to tell the computer to accept guesses again and again until the guess is correct? A loop block, of course. The exit condition from the loop is that the guess matches the secret word.

Now we can get started on the body of the GUESS WORDS subroutine. The first step is to write a bare-bones outline of the loop block and put it inside GUESS WORDS. Here it is, with the loop in lines 410 through 500:

```
400 'SUB GUESS WORDS
410    'LOOP
_____     do something
_____   IF exit-condition THEN 500
_____     do something
490       GOTO 410
500    'END LOOP
580  RETURN
```

The next step is to figure out what the two "do somethings" and the "exit-condition" are. The first "do something" has to ask for the user's guess and accept it as input. The "exit-condition" is that the guess is correct. The second "do something" has to give the user a helpful hint. Here is a more detailed outline of the loop block:

```
400 'SUB GUESS WORDS
410    'LOOP
_____     ask for guess
_____     input guess
_____   IF guess is correct THEN 500
_____     give a hint
490       GOTO 410
500    'END LOOP
580  RETURN
```

We can easily replace the first two phrases with Basic statements. We need a Basic condition in the IF statement to test whether the guess is correct. If the guess is incorrect, the computer must "give a hint." It will take more than one or two Basic statements to give a hint, so we use a GOSUB and bury details in a new subroutine. Here is the complete version of GUESS WORDS:

```
400 'SUB GUESS WORDS
410    'LOOP
420       PRINT "WHAT'S YOUR GUESS";
430       INPUT G$
440     IF G$ = S$ THEN 500
450       GOSUB 800 'HINT
490       GOTO 410
500    'END LOOP
580  RETURN
```

To test this subroutine, we need a skeleton version of the HINT subroutine. Here it is:

```
800 'SUB HINT
810    PRINT "HINT SUBROUTINE"
980  RETURN
```

Now we can do our testing of GUESS WORDS. We first enter all the new body statements in lines 410 through 500, plus the skeleton version of HINT. Next we enter LET S$ = "CAT" in immediate mode to establish a value for the secret word. Then we enter GOSUB 400 in immediate mode. After that, we can test the loop by replying to the input prompts with a series of words, such as DOG, RAT, BAT, CAT. The computer should stay in the loop, printing HINT SUBROUTINE after each reply until the reply is CAT. After that, the return should occur.

It is tempting now to plunge in and finish work on subroutine HINT. That, however, is a detail that is best put off until we finish with the last of the three original subroutines, WRAP UP. Its job is to have the computer print a final message saying that the game is over and the word was guessed. So little planning is needed for this routine that we can write it directly in Basic and test it in the immediate mode, like the others. Here it is:

```
600 'SUB WRAP UP
810    PRINT "YOU GOT IT!!!"
620    PRINT "THE WORD WAS"; S$
780  RETURN
```

Another Control Block

We have now completed the main routine and all three subroutines it calls. But the job is not over. Subroutine GUESS WORDS has a GOSUB 800 to a subroutine named HINT.

Branch blocks contain two groups of statements only one of which is to be performed.

HINT exists only in skeletal form. What should we write for the body of HINT?

The trick, once again, is *not* to get bogged down in details. Instead, think about the *structure* of the problem. Recall how people play the game. After each wrong guess, Susan tells Bill that the secret word is *either* earlier *or* later in the dictionary than Bill's guess. What kind of program structure tells the computer to do either one thing or another?

The answer is the branch block. (If there are any doubts, just go through the three possibilities allowed by Messrs. Boehm and Jacopini.) Knowing that, the next step is easy: writing a bare-bones outline of the branch block as the body of the HINT subroutine. Here it is:

```
800 'SUB HINT
810    IF condition THEN 850
_____    'FALSE
_____      do something
_____      GOTO 870
850      'TRUE
_____      do something
870    'END IF
980  RETURN
```

Lines 810 through 870 contain the outline of *any* branch block. Our job is to convert "condition" and the two "do somethings" into the right Basic for the job that HINT must do, which is to print one of two possible prompting messages. For example, if the secret word (S$) is CAT and the guess (G$) is BAT, then the computer should print LATER THAN BAT. If the guess is RAT, the computer should print EARLIER THAN RAT. Here is a more specific outline of the branch block:

```
800 'SUB HINT
810    IF secret earlier than guess THEN 850
_____    'FALSE
_____      give "later" hint
_____      GOTO 870
850      'TRUE
_____      give "earlier" hint
870    'END IF
980  RETURN
```

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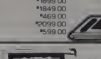

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CIRCLE 116 ON READER SERVICE CARD

VISA

It is easy now to translate this outline from English directly into Basic. Here is the final version of HINT:

```
800 'SUB HINT
810     IF S$ < G$ THEN 850
820       'FALSE
830         PRINT "LATER THAN"; G$
840         GOTO 870
850       'TRUE
860         PRINT "EARLIER THAN"; G$
870     'END IF
980   RETURN
```

Like the other subroutines, this one can also be tested in the immediate mode. Entering the statements, LET S$ = "CAT", LET G$ = "DOG", and GOSUB 800, should produce the hint EARLIER THAN DOG. After that, entering the statements

Programs in this form are especially easy to work with on a CRT display.

LET G$ = "BEE" and GOSUB 800, should yield the hint LATER THAN BEE.

The Complete Program

Now all the routines have been planned, written, entered into the computer, and fully tested *independently* of one another. The only thing left is to confirm that all the parts work together correctly. We do that by typing RUN, entering a secret word, and then trying a sequence of guess words. Since all the parts have been tested, we expect the whole to work. It does. Here it is:

```
100 'PROGRAM GUESSING GAME
110     GOSUB 200   'SECRET WORD
120     GOSUB 400   'GUESS WORDS
130     GOSUB 600   'WRAP UP
140   END
190 '
200 'SUB SECRET WORD
210     CLS
220     PRINT "WHAT'S THE SECRET WORD";
230     INPUT S$
380   RETURN
390 '
400 'SUB GUESS WORDS
410     'LOOP
420         PRINT "WHAT'S YOUR GUESS";
430         INPUT G$
440       IF G$ = S$ THEN 500
450         GOSUB 800 'HINT
490         GOTO 410
500     'END LOOP
580   RETURN
590 '
600 'SUB WRAP UP
610     PRINT "YOU GOT IT!!!"
620     PRINT "THE WORD WAS"; S$
780   RETURN
790 '
800 'SUB HINT
810     IF S$ < G$ THEN 850
820       'FALSE
830         PRINT "LATER THAN"; G$
840         GOTO 870
850       'TRUE
860         PRINT "EARLIER THAN"; G$
870     'END IF
980   RETURN
```

There are a few noteworthy things about programs written in this structured form. First of all, they are practically self-documenting. The only remark statements used are there for structural reasons: to mark the beginnings of routines, the beginnings and endings of control blocks, and the TRUE and FALSE cases in the branch block. Copious explanatory remarks are missing because they are not needed.

Second, programs in this form are especially easy to work with on a CRT display. Limited screen size makes it impossible to see the entire listing of a long program. But if you need to find something in the listing of a long *structured* program, there is a simple and straight forward method. Begin by listing the first dozen or so lines, which contain the main routine. In the listing, each GOSUB contains a tail remark describing the purpose of the subroutine, *and* contains the line number at which the routine begins. Therefore, you can use the main routine as a "table of contents" for the whole program. And, by keeping each routine under 20 lines or so, you can list all its statements on your screen.

Most important of all, structured programs are easy to understand and, for that reason easy to modify and to maintain. That is the topic we turn to next.

Making Refinements

Step 5 of the top-down method is to make refinements to the program. No matter how much care and planning go into a

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The following oscilloscope tracings measure a 1000 volt surge imposed onto a power line.

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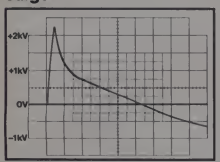
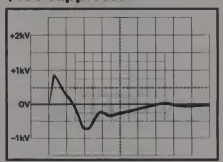


The unsuppressed surge reaches a peak of 2,200 volts.

$150 suppressor



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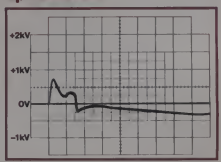

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CIRCLE 182 ON READER SERVICE CARD

program, it seems always true that as soon as the program runs successfully, we discover changes and revisions that need to be made. In that sense, writing a program is like writing a paper or report: when we see the whole draft for the first time, we feel the need to revise and improve.

Structured programs lend themselves to easy revision, modification, and refinement. This fact becomes truly clear only when you see an example. Therefore, let's look at our GUESSING GAME program with a jaundiced eye and see what is wrong with the way it currently works. Here are a few problems that need fixing:

1. After someone enters the secret word, it stays on the screen. The game isn't much of a challenge if the player can look on the screen and see the answer.

2. If someone typed ANTIDISESTABLISHMENTARIANISM as the secret word, it might take a while for the player to guess it.

3. The guessing will go on forever if the player cannot find the secret word. Also, it might be more challenging to allow only a given number of guesses.

Let's see how to attack these problems. The first is easy: making the secret word disappear from the screen after it is entered. We begin by finding the place in the listing to make the change. When deciding what part of a structured program to look at or change, use the main routine as a directory. Here it is:

```
100 'PROGRAM GUESSING GAME
110    GOSUB 200   'SECRET WORD
120    GOSUB 400   'GUESS WORDS
130    GOSUB 600   'WRAP UP
140  END
```

You can see that subroutines GUESS WORDS and WRAP UP have nothing to do with getting the secret word. But subroutine SECRET WORD obviously does. Here is how it looks now:

```
200 'SUB SECRET WORD
210    CLS
220    PRINT "WHAT'S THE SECRET WORD";
230    INPUT S$
380  RETURN
```

When someone replies to the INPUT statement, the secret word stays on the screen. Getting rid of it is easy: Just put another clear-the-screen statement as line 240. The player must look away while the secret word is being typed, but afterward the word will disappear from the screen.

The second problem we need to solve is limiting the length of the secret word. Once again, we need to change subroutine SECRET WORD, *and we can ignore the rest of the program.* Here is how the routine now looks:

```
200 'SUB SECRET WORD
210    CLS
220    PRINT "WHAT'S THE SECRET WORD";
230    INPUT S$
240    CLS
380  RETURN
```

Let's change the subroutines so that if a secret word longer than three characters is entered, the computer will reject the word and ask for a shorter word. If the secret word is three or fewer characters, the game should begin.

As before, the *wrong* way to start is to plunge in with a patchwork of Basic statements. The *right* approach is to ask "What kind of block do I need to use? Is it an action, a loop, or a branch?" The clue lies in the fact that if one keeps entering words longer than three characters, the computer should keep asking for another word. As soon as the length is okay, the computer should stop asking. So we need a loop block.

The loop should begin after the first CLS statement and end before the second. Here is a bare-bones outline:

```
200 'SUB SECRET WORD
210    CLS
215    'LOOP
_____     do something
_____   IF exit-condition THEN 238
_____     do something
236       GOTO 215
238    'END LOOP
240    CLS
380  RETURN
```

The next step is to decide what the "do somethings" and the "exit-condition" should be. The first "do something" is easy: It is just an action block consisting of the present lines 220 and 230, which prompt for input and assign the input to S$. The "exit-condition" is that the length of S$ be three or less. The

The wrong way to start is to plunge in with a patchwork of Basic statements.

second "do something" needs to be a PRINT statement to prompt for a shorter secret word. Here is the final version of the loop:

```
200 'SUB SECRET WORD
210    CLS
215    'LOOP
220       PRINT "WHAT'S THE SECRET WORD";
230       INPUT S$
232     IF LEN (S$) ≤ 3 THEN 238
234       PRINT "TOO LONG"
236       GOTO 215
238    'END LOOP
240    CLS
380  RETURN
```

If the secret word has three characters or fewer, the computer now leaves the loop. If not, the computer goes on to line 234, and prints the TOO LONG prompt. Then the computer returns to the beginning of the loop.

Here is an important point to note: When we first planned subroutine SECRET WORD, it contained only an action block. With the improvement we just made, the subroutine now contains a loop with action blocks inside the loop. More often than not, program revisions mean fundamental changes in block structure. Thinking hard about block structure is the best way to avoid having a program end up looking like a patchwork quilt.

Now we can start thinking about the third problem: how to limit the number of guesses. First, we have to decide which program block should be changed. It certainly cannot be the SECRET WORD subroutine or the WRAP UP subroutine. That leaves only the GUESS WORDS subroutine. Here is how it now stands:

```
400 'SUB GUESS WORDS
410    'LOOP
420       PRINT "WHAT'S YOUR GUESS";
430       INPUT G$
440     IF G$ = S$ THEN 500
450       GOSUB 800   'HINT
490       GOTO 410
500    'END LOOP
580  RETURN
```

At present, the computer stops looping only when the guess is correct. We want the loop to stop when the guess is correct *or* when the player uses up the allowed number of guesses, so we need a *compound* condition in the IF statement. Let's use the variable C to count the number of guesses and agree to limit the guesses to 10. Then the exit-condition needs to be changed to this:

```
G$ = S$ OR C = 10
```

With this change, the IF statement now says to end the loop if C equals 10. But how does the computer know where to start counting? And how does it keep track of the number of guesses? We need two new statements. First, we must set the value of C to 1 (for the *first* guess) *outside* the loop. Second, we must have the computer add 1 to C each time through the loop. Here is the subroutine with the new IF statement and the statements that define and keep track of C.

```
400 'SUB GUESS WORDS
405    LET C = 1
410    'LOOP
420       PRINT "WHAT'S YOUR GUESS";
430       INPUT G$
440       IF G$ = S$ OR C = 10 THEN 500
450         GOSUB 800 'HINT
460         LET C = C + 1
490         GOTO 410
500    'END LOOP
580  RETURN
```

Here is another important thing to note: Even though the above loop depends on a counter that increases in steps of I, it *cannot* be replaced by the FOR/NEXT shortcut. This is true because the exit-condition depends on *two* things: the value of the counter and the value of G$. Trying to use a FOR/NEXT loop here would force us to use either a wild jump out of the loop or tricky manipulation of the loop variable. Using the general form of the loop block avoids these unstructured tactics and improves readability.

That might seem to wrap up the three changes we set out to make. However, the last change has created a new problem: subroutine WRAP UP gives a winning message whether or not the word was guessed. Here is how it reads now:

```
600 'SUB WRAP UP
610    PRINT "YOU GOT IT!!!"
620    PRINT "THE WORD WAS"; S$
780  RETURN
```

The body of the subroutine is now a single action block. What kind of block is needed to print *either* a winning message *or* a losing message? The branch block will do the job, and so we must change the basic structure from an action block to a branch block. Here is the WRAP UP subroutine with a barebones branch outline in lines 601 through 615:

```
600 'SUB WRAP UP
601    IF condition THEN 605
_____     'FALSE
_____        do something
_____        GOTO 615
605       'TRUE
610          PRINT "YOU GOT IT!!!"
615    'END IF
620    PRINT "THE WORD WAS"; S$
780  RETURN
```

Note that we have preserved lines 610 and 620 intact, but 610 is now inside the branch block. Now we must decide on the "condition" and the FALSE "do something." Since line 610 is the TRUE "do something," we want to get the congratulatory message when the "condition" is true. So the "condition" must be G$ = S$. Furthermore, the FALSE "do something" needs to be a YOU LOSE message. Here is the complete branch:

```
600 'SUB WRAP UP
601    IF G$ = S$ THEN 605
602       'FALSE
603          PRINT "YOU LOSE"
604          GOTO 615
605       'TRUE
610          PRINT "YOU GOT IT!!!"
615    'END IF
620    PRINT "THE WORD WAS"; S$
780  RETURN
```

Now the branch block tells the computer to print YOU GOT IT!!! if G$ = S$; that is, if the guess is correct. If G$ < > S$, the computer prints the message YOU LOSE. Either way, the computer prints the secret word on the screen.

We have now finished planning, implementing, and refining the GUESSING GAME program. When in the planning stage, we used the top-down method to break the task into small, meaningful units. When handling any problem in program logic, we needed to use only three formal control blocks: actions, loops, and branches. By adhering strictly to these principles of structured programming, we were able to produce a program that worked, that was easy to read, and that was easy to change. Without ever using the crutch of detailed flowcharts or hours budgeted for brute-force patching and debugging, we got results.

Without ever using the crutch of detailed flowcharts or hours budgeted for brute force patching and debugging, we got results.

The programming task we set ourselves here was a very simple one, of course. It was picked to be a practical size for an article such as this, but also to exemplify a general approach to program development that will work for a task of any size. The method is easy to learn, easy to use, and easy to teach to others. Why and how it has been so successfully kept a secret from the community of Basic programmers for the past decade is hard to fathom.

Coming Next Month

The first three articles in this four-part series have introduced structured programming methods in a language with which most people are familiar: Basic as implemented on today's microcomputers. In these Basics, subroutines, loop blocks, and branch blocks need to be built up from scratch, using very primitive statements: GOSUB, RETURN, IF, and GOTO. Better Basics exist today, and still better ones are on the way, thanks mainly to the efforts of Committee X3J2 of the American National Standards Institute, whose task it is to propose a national standard for a modern version of Basic. In ANSI Basic, the full set of structured programming methods is built into the language. Next month's article will show how to write these fundamental structures in ANSI Basic. ■

The example discussed here is taken from Computer Literacy—A Hands-On Approach, *by Luehrmann and Peckham (McGraw-Hill), which is intended as a school textbook. The same material is also available in a bookstore version called* Computer Literacy Survival Kit, *which includes a program diskette.*

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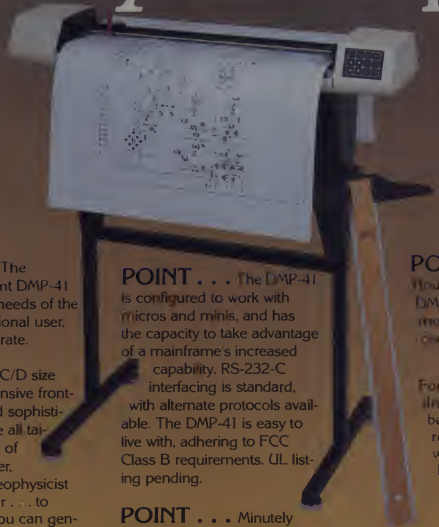

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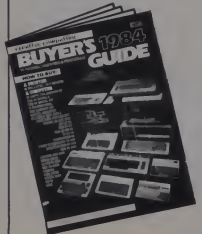

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Going Around, Under And Through Circles: Mathematics and Computer Art

Part 3

Sheldon P. and Florence S. Gordon

In two previous articles, we have discussed the properties of some strange and fascinating mathematical curves known as hypocycloids and epicycloids. In both cases, we started with a large circle of radius A and a smaller circle of radius B. To form a hypocycloid, we traced out the path traversed by a fixed point on the smaller circle as it rolls around the inside of the large circle. (See Figure 1.) To form an epicycloid, we traced out the path formed by a fixed point on the smaller circle as it rolls around the outside of the larger circle. (See Figure 2.)

In each case, the use of computer graphics allowed us to discover some remarkable properties of these curves while at the same time generating some lovely and artistic patterns and shapes.

Both of these types of curves were originally discovered because of a characteristic outlook of mathematicians—the type of curiosity that is always asking "What happens if . . . ?" For example: what happens to a point on a circle rolling around another circle? The answer to such a question was a major project for the mathematicians of the ancient world. With the aid of the modern computer, though, we can answer the same question in seconds, generate far more details, and observe interesting relationships.

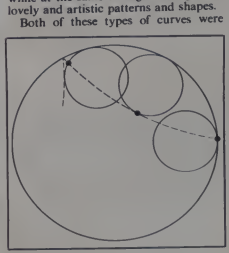


Figure 1. Generating a hypocycloid.

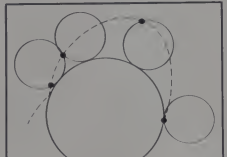


Figure 2. Generating an epicycloid.

In this article, we will look at several further possibilities relating to epicycloids and hypocycloids and see some more mathematical patterns as well as the artistic shapes that result.

The Epicycloid Reconsidered

First, let's consider the epicycloid again. We said that it is formed by tracing the path of a fixed point on a circle as it rolls around the outside of a larger circle. But, what happens if the rolling outer circle is actually larger than the inner circle?

The picture we had in the previous article on the epicycloid (*Creative Computing*, June 1984) were generated by a graphics program which drew the graphs of the curve given by the two parametric equations:

$$X = (A+B)\,COS(T) - B\,COS((A+B)T/B)$$
$$Y = (A+B)\,SIN(T) - B\,SIN((A+B)T/B)$$

In these expressions, B is the radius of the rolling outer circle, and A is the radius of the fixed inner circle. The program doesn't care what A and B stand for; it just plugs their values into the two formulas, calculates the location of the (X,Y) point, and graphs it. Therefore, we can supply any values for A and B to the computer that we want. For instance, we can let B = 2 and A = 1. The result is the heart shaped curve shown in Figure 3. Similarly, if B = 3 and A = 1, we obtain the result in Figure 4. Further, if B = 4 and A = 1, we get the epicycloid shown in Figure 5.

Figure 3.

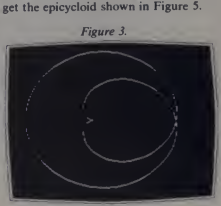


Figure 4.

Figure 5.

Figure 6.

Those of you who have read the previous articles in this series are undoubtedly already counting the number of arches and cusps (the sharp points in the diagrams). It turns out that with all of these curves, the number of cusps is directly related to the values of the two radii. Thus, in Figure 3, there are two cusps and two arches corresponding to B = 2 and A = 1. In Figure 4, there are three cusps and arches with B = 3 and A = 1. Finally, in Figure 5, there are four cusps and arches with B = 4 and A = 1.

If instead you try B = 5 and A = 2, you obtain the shape shown in Figure 6. In this, there are five cusps and five interconnected arches. However, to complete the full curve requires that the rolling circle rotate through two full revolutions about the fixed inner circle. Similarly, if you use B = 8 and A = 3, the resulting shape will contain eight cusps, but will require three full revolutions about the inner circle, as shown in Figure 7. On the other hand, the shape for B = 20 and A = 6, as seen in Figure 8, looks exactly as you would by now expect for B = 10 and A = 3. The common factor of 2 in the radii 20 and 6 essentially is removed when forming the shape of the epicycloid.

All of these curves are perfectly realizable in the sense that a larger circle can roll around the outside of a smaller one. However, it is literally impossible for a larger circle to roll around inside a smaller one if we were to attempt the same type of extension with the hypocycloid. It just can't be done physically or geometrically. But, what happens if we ignore the fact that this is impossible and proceed blithely to give the computer such values? The equations for a hypocycloid are:

$$X = (A-B)\,COS(T) + B\,COS((A-B)T/B)$$
$$Y = (A-B)\,SIN(T) - B\,SIN((A-B)T/B)$$

In these expressions, it is tacitly assumed that B is smaller than A. However, if we give the computer the values B=2 and A=1, it doesn't know that there is no physical significance to these numbers. It doesn't care that they are supposed to represent radii of circles. The computer just puts these values into the two formulas and grinds out the corresponding graph, which is shown in Figure 9. Similarly, the shapes for the pairs (A,B) = (outer, inner) = (1,3) and (1,4) are shown in Figures 10 and 11. In the last two graphs, you will probably notice that the center of each shape contains the same heart shape as for the pair (1,2). Similarly, the pairs (1,5) and (1,8) also contain this shape at the center surrounded by an ever increasing complexity of arcs. See Figures 12 and 13.

What happens if we ignore the fact that this is impossible and proceed blithely to give the computer such values?

Now, let's look at the pair (2,3), whose graph is shown in Figure 14. The pairs (2,5) and (2,7), as shown in Figures 15 and 16, contain the same central shape surrounded also by a variety of ever more complex arcs. Notice, by the way, that we skipped over the pairs (2,4) and (2,6)—they just reduce to the same shapes as (1,2) and (1,3) respectively.

Furthermore, all pairs having A = 3 will contain a spade shape at the center as shown in Figures 17 and 18 for the pairs (3,5) and (3,8) (assuming that there are no common factors to cancel and reduce the shape).

Mathematical Questions

Additional patterns for the shapes generated should be fairly predictable by now. However, there are several questions of a mathematical nature which are not easily answered. First and foremost, you have undoubtedly noticed that some of these last few figures of supposedly non-existent hypocycloids look amazingly like some of the earlier pictures of epicycloids. In particular, the matches are:

Epicycloid	Hypocycloid
(1,2) Figure 3	(1,3) Figure 10
(1,3) Figure 4	(1,4) Figure 11
(1,4) Figure 5	(1,5) Figure 12
(2,5) Figure 6	(2,7) Figure 16

Figure 7.

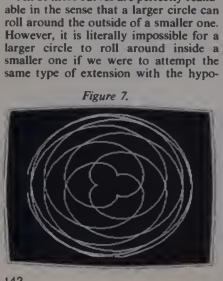


Figure 8.

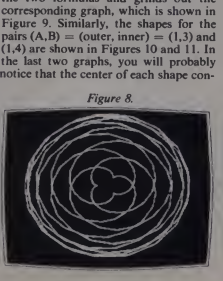
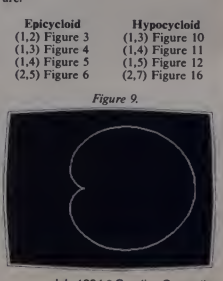


Figure 9.



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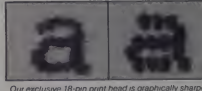

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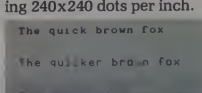

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Figure 10.

Figure 11.

Figure 12.

What gives? To be honest, we reacted the same way when we began writing this article. The matching shapes are not something known to every mathematician. Remember, we did say at the beginning that computer graphics gives the mathematician the opportunity to learn new things about his subject. The above table does suggest some possible relationships, though. For example, the epicycloid with (1,N) will probably give the same shape as the hypocycloid with (1, N+1) for any integer N. (Is that true if N is negative? Hmmm.) But what about the epicycloid with (2,5) versus the hypocycloid with (2,7)? For that matter, the epicycloid with (3,8) is certainly related to the hypocycloids with (3,5) and (3,8), though neither one is quite identical. What value of N in the hypocycloid with (3,N) will be the same as the epicycloid with (3,8)?

Further, what is the general pattern relating epicycloids and hypocycloids? We leave these points for the interested reader to ponder and answer by some judicious experimentation, with the appropriate programs. (These questions can also be answered using a fair amount of algebraic and trigonometric manipulation, but that approach is decidedly less exciting.)

There are some other open questions regarding these curves that are also worth considering. In the previous situations, there was a clear relationship between the number of cusps and arches and the values for the radii. In the current case, there does not seem to be an obvious connection. Can you deduce such relationships? For that matter, is there any connection between the radii or the number of arcs and the number of points of intersections between the arcs? Answer these questions and you will be well on your way to becoming a true mathematician.

What makes these shapes even more interesting is watching how they are actually formed by the computer. When you look at the finished products, you might come to the conclusion that the inner shape is formed first and then the outer loops are traced out around it. This is not at all the case. Rather, the curves loop around repeatedly and, on each revolution, contribute a small portion to the central figure. It is only as the full diagram is completed that the central figure is completed as well.

What makes these shapes even more interesting is watching how they are actually formed by the computer.

The Programs

To get a feel for this, it is almost essential that you run the actual programs. Therefore, we have included here simplified listings that will enable you to produce all of these non-existent curves. The programs are designed for the TRS-80 Color Computer with Extended Basic; however, it is fairly easy to modify them to function on most other small computers with graphics capabilities. From that point on, you can interpret the results either as a series of intriguing and artistic shapes or as a challenge to discover some new mathematical principles.

If you chose the first alternative, then a limitation in the programs will allow you to generate even more striking artistic effects. To produce the graphs relatively quickly, the programs use a maximum of 400 subdivisions of the full curve. When the sizes of the radii are relatively large, however, the programs generate only approximations of the correct curve. These approximations can produce some truly remarkable shapes, as demonstrated in Figures 19, 20 and 21 for the pairs of radii (1000,5000), (2500,10000) and (2222,8888).

What is even more dramatic is the dynamic way in which all of these pictures are generated on the computer. In an article such as this, it is simply impossible to include all (or even any) of the strikingly beautiful intermediate stages that are produced on the screen on the way to creating the final figures shown. That is something that really must be experienced. Further, it is an experience that can be reproduced at the push of a button.

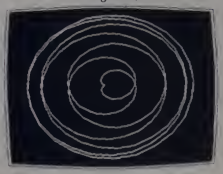


Figure 13.

Figure 14.

Figure 15.

Figure 16.

Figure 17.

Figure 18.

Listing 1. Hypocycloid Plot.

```
10 PMODE 4,1
20 SCREEN 0,0
30 CLS
40 PRINT:PRINT:PRINT
50 PRINT"       THIS PROGRAM GRAPHS "
60 PRINT
70 PRINT "          ANY HYPOCYCLOID"
80 PRINT:PRINT:PRINT
90 PRINT"PROGRAM WRITTEN BY FLORENCE AND
     SHELDON GORDON"
100 PRINT:PRINT"     COPYRIGHT 1984
110 FOR T = 0 TO 1200 : NEXT T
120 CLS
130 PRINT:PRINT:PRINT
140 INPUT "WHAT IS THE LARGE RADIUS";AA:PRINT
150 INPUT "WHAT IS THE SMALL RADIUS";BB
160 C1=AA-BB
170 C2=C1/BB
180 DEF FNX(T)=C1*COS(T) + BB*COS(C2*T)
190 DEF FNY(T)=C1*SIN(T)-BB*SIN(C2*T)
200 A=0:B=6.28*BB
210 IF BB=AA THEN N1=AA:N2=AA
220 IF BB AA THEN N1=AA/BB:N2=N1
230 M1=N1:M2=N2
240 D=(N2-N1)/255:E=(M2-M1)/191
250 PCLS
260 NR=20*(AA+BB)
270 IF NR 400 THEN NR=400
280 REM DRAW GRAPH
290 SCREEN 1,1
300 H=INT((FNX(A)-N1)/D+.5)
310 V=191-INT((FNY(A)-M1)/E+.5)
320 LINE(H,V)-(H,V),PSET
330 ST=(B-A)/NR
340 FOR T=A+ST TO B STEP ST
350 X=FNX(T)
360 H=INT((X-N1)/D+.5)
370 Y=FNY(T)
380 V=191-INT((Y-M1)/E+.5)
390 LINE-(H,V),PSET
400 NEXT T
410 SOUND 100,10
420 GOTO410
430 END
```

Listing 2. Epicycloid Plot.

```
10 PMODE 4,1
20 SCREEN 0,0
30 CLS
40 PRINT:PRINT:PRINT
50 PRINT"       THIS PROGRAM GRAPHS "
60 PRINT
70 PRINT "          ANY EPICYCLOID
80 PRINT:PRINT:PRINT
90 PRINT"PROGRAM WRITTEN BY FLORENCE AND
     SHELDON GORDON"
100 PRINT:PRINT"     COPYRIGHT 1984
110 FOR T = 0 TO 1200 : NEXT T
120 CLS
130 PRINT:PRINT:PRINT
140 INPUT "WHAT IS THE LARGE RADIUS";AA:PRINT
150 INPUT "WHAT IS THE SMALL RADIUS";BB
160 C1=AA+BB
170 C2=C1/BB
180 DEF FNX(T)=C1*COS(T) - BB*COS(C2*T)
190 DEF FNY(T)=C1*SIN(T)-BB*SIN(C2*T)
200 A=0:B=6.28*BB
210 N1=-AA-20*BB:N2=-N1
220 M1=N1:M2=N2
230 D=(N2-N1)/255:E=(M2-M1)/191
240 PCLS
250 NR=2*(AA+BB)
260 IF NR 400 THEN NR=401
270 REM DRAW GRAPH
280 SCREEN 1,1
290 H=INT((FNX(A)-N1)/D+.5)
300 V=191-INT((FNY(A)-M1)/E+.5)
310 LINE(H,V)-(H,V),PSET
320 ST=(B-A)/NR
330 FOR T=A+ST TO B STEK ST
340 X=FNX(T)
350 H=INT((X-N1)/D+.5)
360 Y=FNY(T)
370 V=191-INT((Y-M1)/E+.5)
380 LINE-(H,V),PSET
390 NEXT T
400 SOUND 100,10
410 GOTO410
420 END
```

Figure 19.

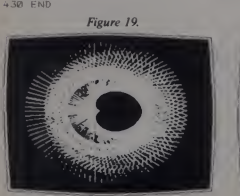


Figure 20.

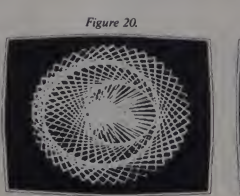
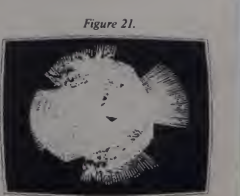


Figure 21.



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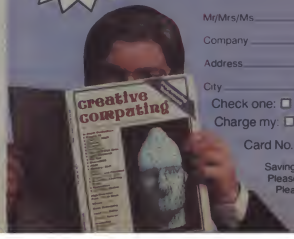

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Plotting and Graphics Tutorial

THE SIERPINSKI CURVE: A LESSON IN DEBUGGING AND CONVERSION

David H. Ahl

In several recent tutorials, I promised to publish a routine for plotting the Sierpinski curve, one of the most fascinating curves in mathematics (see box). I had seen several ways of approaching the problem, but by far the most elegant was a demonstration program on a NEC 8801 computer which used the N. Wirth algorithm.

I managed to get a listing of the relevant portion of the program, but upon examining it more closely, I realized that it employed several statements with which I was unfamiliar. Several were minor variations of statements in MSX Basic, but LINE -STEP (H,H) and its variants really had me stumped (see lines 7370-7400 in Listing 1). To make matters worse, I had no way of easily obtaining the Basic manual for the system. Moreover, the five books I had on MBasic had no description of the graphics commands (see box).

Listing 1. Statements from original NEC program.

```
7300 '-- display routine --
7310 *SIERPIN
7320   H0=512:SP=0:H=H0\4:X=2*H:Y=3*H:I=0
7330   I=I+1:X=X-H:H=H\2:Y=Y+H
7340     IF I<0I THEN 7330
7350   POINT(X,Y):COLOR ,,,COL
7360   PSVAL=I:GOSUB *PUSH
7370   GOSUB *SUBAA:LINE -STEP(H,-H)
7380   GOSUB *SUBBB:LINE -STEP(-H,-H)
7390   GOSUB *SUBCC:LINE -STEP(-H,H)
7400   GOSUB *SUB00:LINE -STEP(H,H)
7410   GOSUB *POP
7420   RETURN
7430 '
7440 *SUBAA
```

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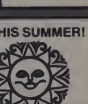

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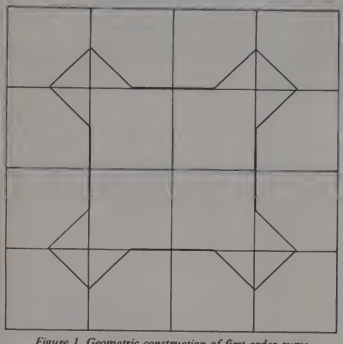

Figure 1. Geometric construction of first order curve.

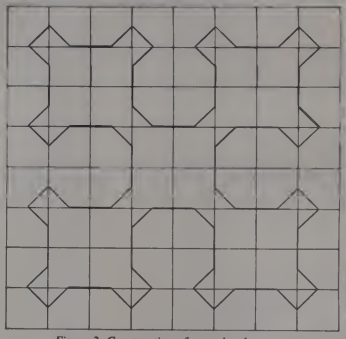

Figure 2. Construction of second order curve.

Sometime in the 1700's, mathematicians described the word "curve" more precisely than had been done previously by defining a curve as the loci of points that satisfy equations that are continuous functions.

If a curve describes a continuous function, it certainly ought to be possible to draw a tangent to any point on the curve. However, by the mid-1800's, mathematicians began to find strange, new curves that had no unique tangent at any point. One of the most famous such curves was one described in 1890 by Giuseppe Peano. This Italian logician showed how a single point, moving continuously over a square, could pass at least once through every point on the surface of the square and its boundary. Peano's curve is a legitimate diagram of a continuous function, yet nowhere on it can a unique tangent be drawn because at no instant can one specify the direction in which the point is moving.

It wasn't long before other logicians proposed curves with similar properties. Two of the most interesting are the curves devised by David Hilbert and Waclaw Sierpinski. Figure 1 shows the method of constructing the basic closed Sierpinski curve. Figure 2 shows the construction of a second order curve.

An interesting problem for computer enthusiasts is to find the area bounded by the Sierpinski curve at its upper limit. From Figure 1, we can see that of the 16 smaller squares, a first order Sierpinski curve occupies four squares completely plus 12 one-eighths, or a total of 11/32 of the total.

Looking at Figure 2, we see that one-quarter of the second order curve occupies the same area as the first order curve plus 7/8 of the corner square, or 11/32 plus 7/8 /16 which equals 51/128.

If we generalize this progression, we find that the denominator of each new term is four times the previous denominator. Each numerator is four times the previous numerator plus 7. Thus the first few terms of the series are:

11	51	211	851	3411	13651
32	128	512	2048	8192	32768

I leave it up to readers to write a short program to determine the area bounded by the upper limit Sierpinski curve. This area should be expressed as a fraction.

There is much more to be said about Sierpinski and other "monster" curves, but Martin Gardner has said it much more elegantly than I can. See especially "Mathematical Games" in *Scientific American*, Sept. 1976.

LINE AND LINE STEP

The LINE STEP command is implemented in later versions of Microsoft GW Basic. Basically, the command LINE (X,Y)-STEP(a,b) means to move the distance a in the x direction and b in the y direction from the point X,Y. In other words, the command LINE (5,8)-STEP(2,3) would draw a line from 5,8 to 7,11.

Just the command LINE -STEP(a,b) alone would draw a line from the last graphics point plotted (or from 0,0 if nothing had been previously plotted). Readers with GW Basic have their choice of using either the lines in the subroutine at 800 or substituting LINE-STEP. However, when we start to do transformations and tilt the curve, the LINE -STEP command will no longer work since all x and y coordinates are expressed as absolute values. Also, the generalized subroutine at 800 can be easily adapted to most plotters whereas the LINE -STEP command cannot.

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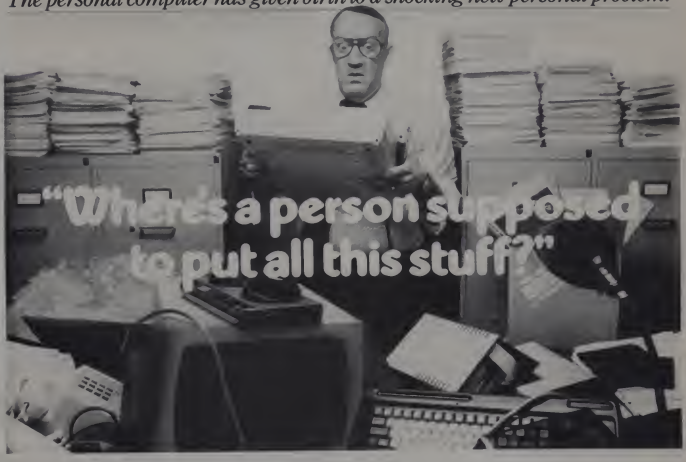

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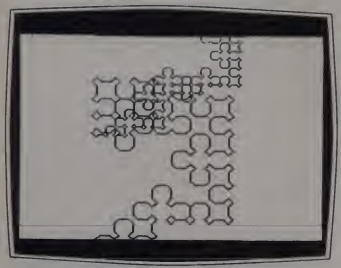

Figure 1. Incorrect curve drawn with Listing 2.

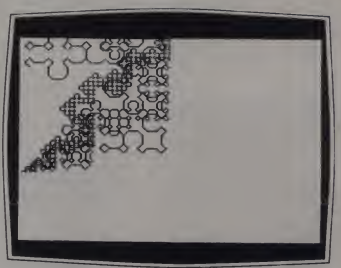

Figure 2. Removal of dummy plot variables.

This is a situation frequently faced by programmers. You would like to take advantage of the work done by someone else and not, so to speak, reinvent the wheel. However, the routine you want is in another language or a different dialect of the language in which you are working. What to do?

Since I had a good idea of the shape of the Sierpinski curve, I could deduce what the program should be doing. Basically, the end point of each new line should be fairly close to the previous point and should differ by a one or two units in the x or y direction, or both. Consequently, it appeared that the two variables in the STEP portion of the LINE statement were x and y increments. Since MSX Basic does not have an incremental plot function, I substituted a subroutine (lines 800-820) and two variables, A and B, for the LINE STEP statement. Cumbersome, but I thought it would work (see Listing 2).

Unfortunately, the program in Listing 2 did nothing of the kind, and produced the curve in Figure 1. Obviously something was wrong. But what?

My first thought was that the plotting subroutine perhaps did not need the dummy variables C and D to represent X and Y, so I eliminated them from the subroutine. I was rewarded with the curve in Figure 2—hardly an improvement.

```
800 ' Plotting Subroutine
810 LINE(X,Y)-(X+A,Y+B)
820 X=X+A:Y=Y+B:RETURN
```

Well, of course! The initial value of HO (see line 100) should be set to the vertical height of the screen, or 192. At least that's what I thought before I saw the output in Figure 3. Actually, it

Listing 2. First conversion of program to MSX Basic.

```
10 SCREEN 1
15 C=641D=192
20 FOR DI=3 TO 5
30 GOSUB 100
40 NEXT DI
50 GOTO 50
100 H0=192:SP=0:H=H0/4:X=2*H:Y=3*H:I=0
110 I=I+1:X=X-H:H=H/2:Y=Y+H
120 IF I(DI THEN 110
130 PS=1:GOSUB 600
140 GOSUB 200:A=H:B=-H:GOSUB 800
150 GOSUB 300:A=-H:B=-H:GOSUB 800
160 GOSUB 400:A=-H:B=H:GOSUB 800
170 GOSUB 500:A=H:B=H:GOSUB 800
180 GOSUB 700
190 RETURN
200 ' Subroutine A
210 IF TP(=0 THEN RETURN
220 PS=TP-1:GOSUB 600
230 GOSUB 200:A=H:B=-H:GOSUB 800
240 GOSUB 300:A=2*H:B=0:GOSUB 800
250 GOSUB 500:A=H:B=H:GOSUB 800
260 GOSUB 200
270 GOSUB 700
280 RETURN
300 ' Subroutine B
310 IF TP(=0 THEN RETURN
320 PS=TP-1:GOSUB 600
330 GOSUB 300:A=-H:B=-H:GOSUB 800
340 GOSUB 400:A=0:B=-2*H:GOSUB 800
350 GOSUB 200:A=H:B=-H:GOSUB 800
360 GOSUB 300
370 GOSUB 700
380 RETURN
400 ' Subroutine C
410 IF TP(=0 THEN RETURN
420 PS=TP-1:GOSUB 600
430 GOSUB 400:A=-H:B=H:GOSUB 800
440 GOSUB 500:A=-2*H:B=0:GOSUB 800
450 GOSUB 300:A=-H:B=-H:GOSUB 800
460 GOSUB 400
470 GOSUB 700
480 RETURN
500 ' Subroutine D
510 IF TP(=0 THEN RETURN
520 PS=TP-1:GOSUB 600
530 GOSUB 500:A=H:B=H:GOSUB 800
540 GOSUB 200:A=0:B=2*H:GOSUB 800
550 GOSUB 400:A=-H:B=H:GOSUB 800
560 GOSUB 700
570 RETURN
600 ' Push subroutine
610 SP=SP+1:ST(SP)=PS
620 TP=PS:RETURN
700 ' Pop subroutine
710 SP=SP-1:TP=ST(SP):RETURN
800 ' Plotting Subroutine
810 LINE(C,D)-(C+A,D+B)
820 C=C+A:D=D+B:RETURN
```

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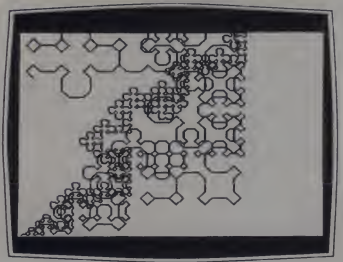

Figure 3. Curve with increased vertical height.

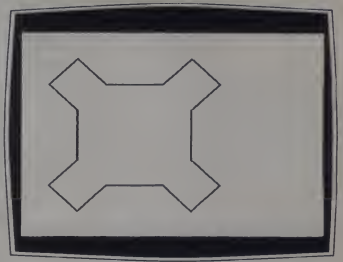

Figure 4. First order curve.

was slightly better than the previous one, but it occurred to me that I really should start at the beginning—with just one, large curve.

```
100 H0=192:SP=0:H=H0/4:X=2+H:Y=3+H:I=0
```

Hence, I changed the main loop to go from 1 to 1 and wound up with the curve in Figure 4. Ah, that's better; at least the program can draw one complete curve successfully.

```
20 FOR DI=1 TO 1
30 GOSUB 100
40 NEXT DI
```

Next I enlarged the loop to draw the second curve and got the curve shown in Figure 5.

```
20 FOR DI=1 TO 2
30 GOSUB 100
40 NEXT DI
```

Where were the last three segments of the second order curve? I had no idea, so I pored over the original program once again and compared it to my translated version. Lo and behold, I found a line missing in subroutine D, in particular, the one in which it calls itself. I inserted this as line 560, ran the program again, and was rewarded with two complete curves (Figure 6).

```
500 ' Subroutine D
510 IF TP<=0 THEN RETURN
520 PS=TP-1:GOSUB 600
530 GOSUB 500:A=H:B=H:GOSUB 800
540 GOSUB 200:A=0:B=2*H:GOSUB 800
550 GOSUB 400:A=-H:B=H:GOSUB 800
560 GOSUB 500
570 GOSUB 700
580 RETURN
```

You might wonder why I didn't just start here and publish this debugged program in *Creative Computing*. After all, you certainly don't care about the incorrect version. My reason for publishing the prior steps is to illustrate the process of conversion from one dialect of Basic to another and to show that, all too often, problems that we blame on the program are something else entirely. You would be amazed at the number of letters and phone calls I get about a program in *Basic Computer Games* or *Creative Computing* that "doesn't work" because the person copying it has left out a line or copied incorrectly.

Figure 5. Second order curve missing three segments.

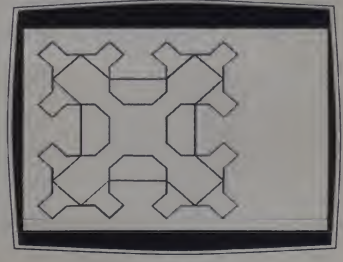

Figure 6. First and second order curves.

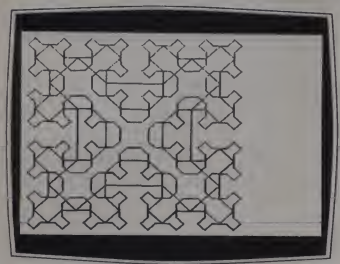

Figure 7. First to third order curves.

Figure 8. Second to fourth order curves.

Back to Mr. Sierpinski. Things now appeared to be in order, so I expanded the number of curves to three and got a correct plot (see Figure 7).

```
20 FOR DI=1 TO 3
30 GOSUB 100
40 NEXT DI
```

What happens when the upper and lower bounds of the main loop are changed? I tried the program with limits of 2 and 4 and got the delightful output shown in Figure 8.

```
20 FOR DI=2 TO 4
30 GOSUB 100
40 NEXT DI
```

Could a fifth level curve be plotted? Yes, but the resolution of my SpectraVideo 328 and Sakata monitor started to go over the brink (see Figure 9), so I settled for a fourth level curve.

Next, I introduced some color with two additional statements (25 and 35). This colors the background after the first curve is drawn and then uses different colors for the next two curves. The effect is quite striking!

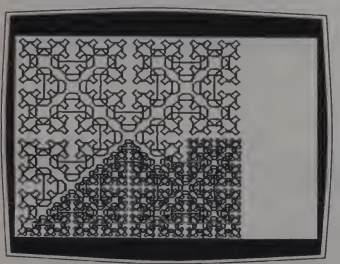

Figure 9. Fifth order curve (partially drawn) exceeds screen resolution.

```
20 FOR DI=2 TO 4
25 CO=4*(DI-1)
30 GOSUB 100
35 IF DI=2 THEN PAINT (191,191),CO
40 NEXT DI
```

Okay, everything now worked and it was time to tidy up the program with a few remarks, labels, and blank lines. The final program is shown in Listing 3. It is a great deal of fun to watch these curves being traced out on the screen; try it!

Putting the screen plot routine into a subroutine instead of 16 separate LINE statements as in the original had an unexpected benefit, namely that it can be easily changed for different computers or for a plotter. For example, suppose you have a Houston Instruments DMP-29 plotter. To plot the Sierpinski curve on your plotter requires just the following five new lines.

```
30 PRINT #1,"Z :: A"
70 PRINT #1,"U"
90 PRINT #1,"P0":END
125 PRINT #1,X,Y "D"
810 PRINT #1,X+A, Y+B
```

Line 30 initializes the plotter; line 125 moves the pen to the starting point and puts it down; line 810 does the actual plot; line 70 raises the pen; and line 90 moves the pen home. If you have a different plotter, you should have no trouble getting this routine to work. The curve at the opening of the article was done with this program.

This program, incidentally, takes advantage of the feature in MSX Basic and MBasic that permits a subroutine to call itself. This is known as recursion. It is often said that languages such as Basic and Fortran do not permit recursion. This is simply not true. While not all versions of Basic permit a subroutine to call itself, there are other ways of achieving recursion, but that is a subject for another day. (If you wish to delve into it, pick up a copy of any one of my *Ideabooks*, and you will find an entire chapter devoted to solving problems using recursion in Basic).

Be sure to look at the following article in which William Fujimoto has devised several interesting variations of the Sierpinski curve using the C language on an Altos 8600 with a Houston Instruments DMP-2 plotter. (No, I don't pretend you can easily translate from C to Basic, but using this Basic program you ought to be able to implement some of the variations suggested by Mr. Fujimoto).

Figure 10. Tilted second and third order curves.

Figure 11. Tilted fourth order curve.

For example, a tilted curve can be implemented in the Basic program just by adding and changing a few lines. Dummy plot variables (XP, YP, XQ, and YQ) are set up in lines 115 and 116 and then updated in the plot subroutine. This produces the "tilted" plots in Figures 10 and 11..

```
115 YP=SQR(Y)*7
116 XP=X*(-Y/(2+H0)+1)+Y/4
800 ' Plotting Subroutine
805 X=X+A:Y=Y+B
810 YQ=SQR(Y)*7
812 XQ=X*(-Y/(2+H0)+1)+Y/4
815 LINE (XP,YP)-(XQ,YQ)
820 XP=XQ:YP=YQ:RETURN
```

Listing 3. Final Sierpinski Curve program.

```
10 CLS:COLOR 15,1:LOCATE 11,5
20 PRINT "Sierpinski Curve"
30 LOCATE 13,9:PRINT "by David Ahl"
33 '
34 ' Main Loop
35 FOR N=1 TO 900:NEXT N
40 SCREEN 1:FOR DI=2 TO 4
50 CO=4*(DI-1)
60 GOSUB 100
70 IF DI=2 THEN PAINT (191,191),CO
80 NEXT DI
90 GOTO 90
98 '
99 ' Initialization and main curve
100 H0=192:SP=0:H=H0/4:X=2+H:Y=3+H:I=0
110 I=I+1:X=X-H:H=H/2:Y=Y+H
120 IF I<DI THEN 110
130 PS=1:GOSUB 600
140 GOSUB 200:A=H:B=-H:GOSUB 800
150 GOSUB 300:A=-H:B=-H:GOSUB 800
160 GOSUB 400:A=-H:B=H:GOSUB 800
170 GOSUB 500:A=H:B=H:GOSUB 800
180 GOSUB 700
190 RETURN
199 '
200 ' Subroutine A
210 IF TP(=0 THEN RETURN
220 PS=TP-1:GOSUB 600
230 GOSUB 200:A=H:B=-H:GOSUB 800
240 GOSUB 300:A=2*H:B=0:GOSUB 800
250 GOSUB 500:A=H:B=H:GOSUB 800
260 GOSUB 200
270 GOSUB 700
280 RETURN
299 '
300 ' Subroutine B
310 IF TP(=0 THEN RETURN
320 PS=TP-1:GOSUB 600
330 GOSUB 300:A=-H:B=-H:GOSUB 800
340 GOSUB 400:A=0:B=-2*H:GOSUB 800
350 GOSUB 200:A=H:B=-H:GOSUB 800
360 GOSUB 300
370 GOSUB 700
380 RETURN
399 '
400 ' Subroutine C
410 IF TP(=0 THEN RETURN
420 PS=TP-1:GOSUB 600
430 GOSUB 400:A=-H:B=H:GOSUB 800
440 GOSUB 500:A=-2*H:B=0:GOSUB 800
450 GOSUB 300:A=-H:B=-H:GOSUB 800
460 GOSUB 400
470 GOSUB 700
480 RETURN
499 '
500 ' Subroutine D
510 IF TP(=0 THEN RETURN
520 PS=TP-1:GOSUB 600
530 GOSUB 500:A=H:B=H:GOSUB 800
540 GOSUB 200:A=0:B=2*H:GOSUB 800
550 GOSUB 400:A=-H:B=H:GOSUB 800
560 GOSUB 500
570 GOSUB 700
580 RETURN
599 '
600 ' Push subroutine
610 SP=SP+1:ST(SP)=PS
620 TP=PS:RETURN
699 '
700 ' Pop subroutine
710 SP=SP-1:TP=ST(SP):RETURN
799 '
800 ' Plotting Subroutine
810 LINE(X,Y)-(X+A,Y+B),CO
820 X=X+A:Y=Y+B:RETURN
```

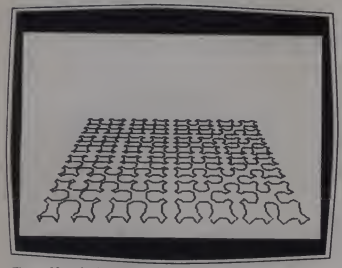

Figure 12. Tilted fourth order curve with straight sides.

If you would rather have straight sides as in Figure 12, it is simply a matter of changing two lines.

```
116 XP=X*(-YP/H0+1)+YP/2
812 XQ=X*(-YP/H0+1)+YP/2
```

But enough. I could go on forever with more variations. But unlike the Sierpinski curve which has no end, this article does. Here it is. ■

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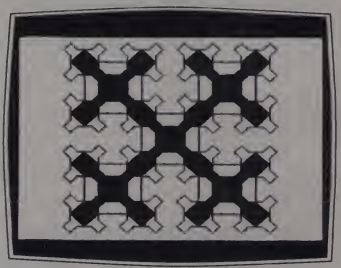


Figure 13. The PAINT command was used to fill in the center area of a second and third order curve.

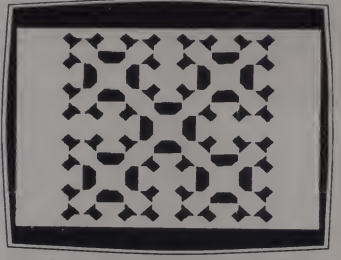


Figure 14. Reversed image of Figure 13 with the outside also filled in.

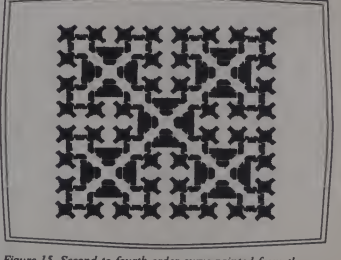
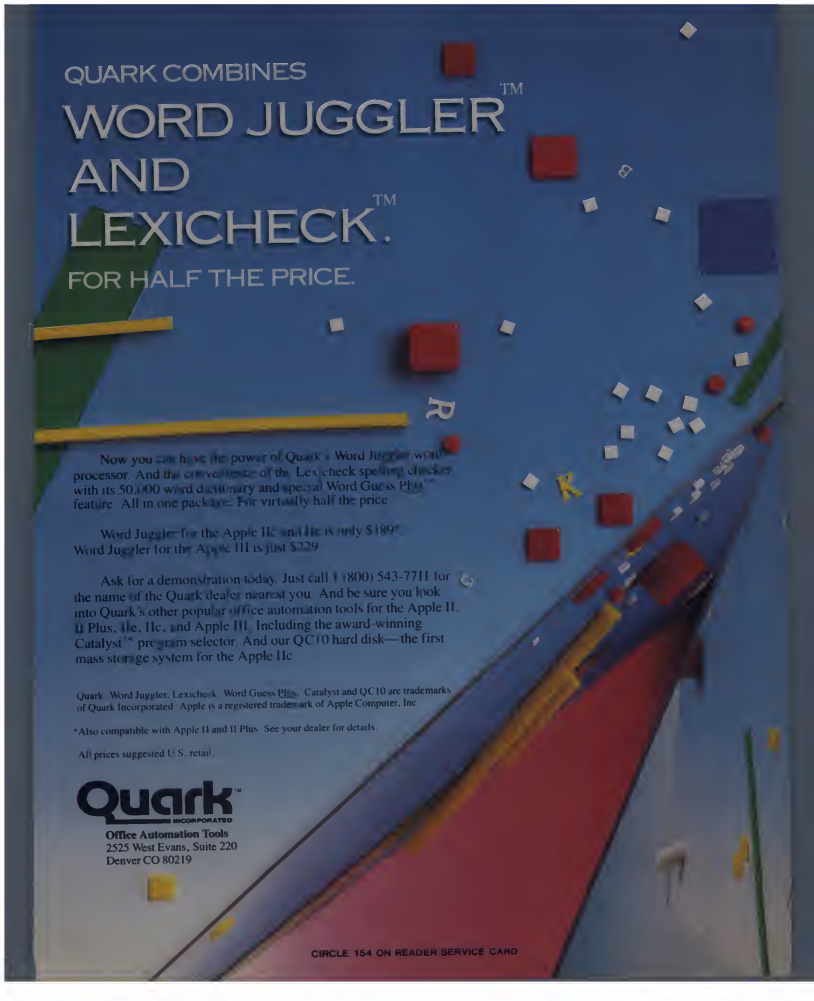


Figure 15. Second to fourth order curve painted from the center and outside.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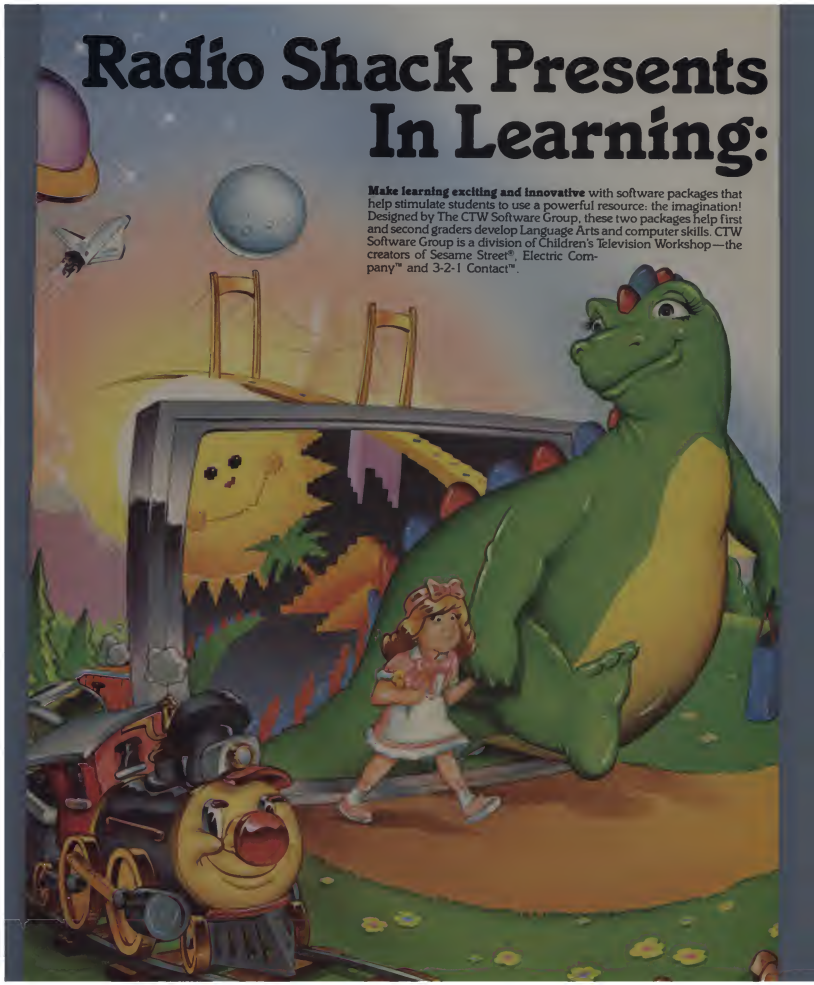

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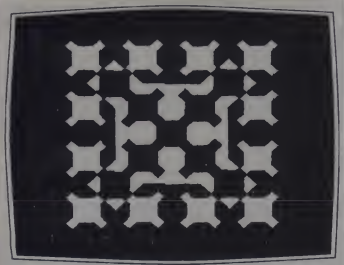

Figure 16. First to third order curve painted from the center and outside.

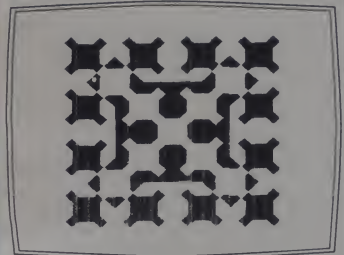

Figure 17. Reversed image of Figure 16.

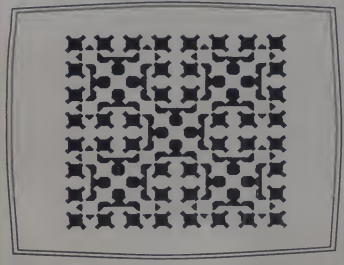

Figure 18. Second and fourth order curve painted from the center and outside.

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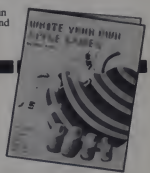

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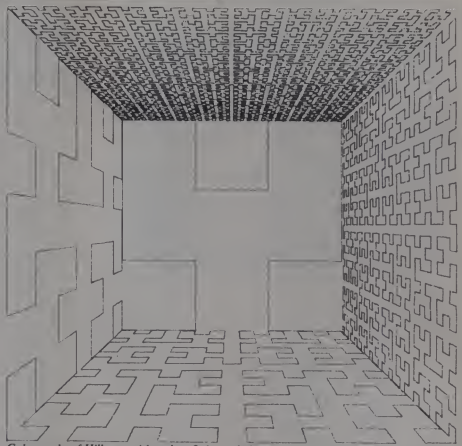
Transformation and Rotation of Hilbert and Sierpinski Curves

The Plot Thickens



Cube made of Hilberts with orders 2 through 6.

William Fujimoto

Personal computers and low cost plotters have opened the door to fascinating graphics for people like me who can now create drawings that would be impossible to produce freehand.

This article describes a method for plotting Hilbert and Sierpinski curves and rotating and transforming them to achieve interesting effects.

Hardware

The plotter I use is an Houston Instruments DMP-2. Except for an etch-a-sketch, there is probably not a more basic or "dumber" plotter in existence. The available commands for it are few. They are pen up, pen down, and move one step in one direction. The pen can move in eight directions which are increments of 45 degrees. Think of them as points of the compass (i.e., N, E, S, W and NE, SE, SW, NW).

Unlike some inexpensive plotters currently available, you cannot explicitly tell the pen on this device to move from one arbitrary point to another. It has no "home" or 0,0 point; positions such as these can be reached manually by turning two knobs on the side of the machine until the desired spot is reached.

The DMP-2 has no ASCII character generator nor any built in plots for curves or figures such as circles or squares. These functions must be obtained through software if needed.

Connection to a computer can be made with either parallel or RS-232 lines. I currently use the serial line. In the serial mode a step is made by sending to the DMP-2 a lowercase letter from p through w, and pen up or pen down with lowercase y and z, respectively. For example, a vertical line (direction north) 10 steps long is drawn by sending a pen down and 10 p's—zpppppppppp. To make a diagonal line 5 steps to the southwest, the string zuuuuu would be sent. The resolution of this machine is 200 steps per inch vertically and horizontally.

I have used the DMP-2 with an Apple and at present have it hooked to an Altos 8600 at serial port two.

Software

To make Hilbert and Sierpinski plots easily, some language with recursion must be used. Since recursion is not part of Basic or Fortran (*Some versions of Basic and Fortran do have recursion, in particular, MBasic, MSX Basic, and PDP-11 Basics.—Ed.*) and since the Altos runs under Xenix, I had available the C language with which to write my programs. Pascal and PL/1 are alternatives.

In addition to the two recursive plotting programs themselves, I developed routines in C for drawing circles, point-to-point lines, and lines at any angle and of any length. So, with simple commands, figures of any shape could be made anywhere on the plotter area. These routines are too involved to be described here, but are thoroughly explained in the references. Their use, on the other hand, is straightforward.

As an example, to draw a hexagon one inch on a side the part of a C program shown in Listing 1 could be implemented. A C function made from those lines could be called as hexagon().

```
/*  first manually move the pen to the starting point */
side = 200;                         /* 200 steps per inch  */
pendown();
for (line=1;line<=6;line++) {       /*  loop six times  */
        move(side);                 /*  move an inch  */
        turn(60);                   /* make a 60 degree left hand turn  */
}
penup();
```

Listing 1.

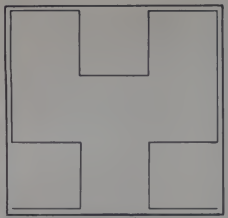


Figure 1. Hilbert order 2.

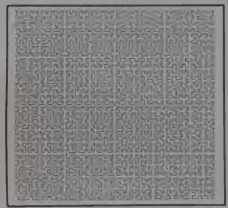


Figure 2. Hilbert order 6.

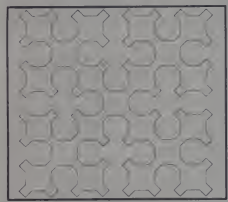


Figure 3. Sierpinski order 2.

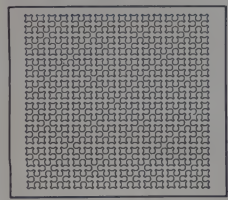


Figure 4. Sierpinski order 4.

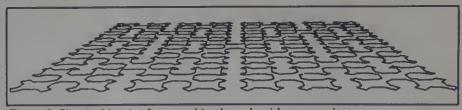


Figure 5. Sierpinski order 3; rotated backwards with perspective.

The Plots

Using Wirth's algorithms and the line drawing routines, I was able to make the Hilbert and Sierpinski curves. Notice that the Hilbert has a beginning and an end point, while the Sierpinski is a closed curve. Orders 2 and 6 (Figures 1 and 2) are shown for the Hilberts, and 2 and 4 (Figures 3 and 4) for the Sierpinskis.

Even though these plots are nice in themselves, it occurred to me that giving them some depth might make them more interesting. What would it look like if one of these patterns were, perhaps, painted onto a frozen lake and viewed from the air? I attempted to have the DMP-2 draw this imaginary form.

Using the mind's eye, picture one of the plots being rotated and translated in space. The computer can simulate these motions with matrix transformation. A transformation is a mathematical way of turning and moving points in space as if real shapes were being manipulated. With 4 x 4 arrays and a three-dimensional cartesian coordinate system, projections of these points can be made by the plotter. The result is what one would expect of an object drawn on a flat piece of paper. Again, look in the references on graphics for details (Figure 5).

Now if the point X=0, Y=0, and Z=0 is at the center of the Hilbert plot, then it is possible to stretch it around a sphere (which, you recall, is represented by the equation $R^2 = X^2 + Y^2 + Z^2$). Whenever X and Y are within the sphere, a Z is calculated, otherwise Z=0. A transformation moves the apparent viewpoint to the left edge and another tilts it backward producing a surface with a spherical concavity in it. A third transformation gives it the desired perspective (Figure 6).

To make the Hilbert sided box with orders 2 to 6 (see the title illustration), it was just a matter of generating, rotating, and shifting the individual plots. The view is through the middle of the box from a position face on.

Other Projects

Curves similar to Sierpinskis and Hilberts that can also be plotted are dragons, flow snakes, and other monster curves.

One other possibility is to synthesize 3-D pictures by looking through red and blue filters at red and blue drawings. Appropriate rotations and translations produce an image with apparent depth.

Another possibility is to have the plotter draw pictures for an animated movie. At one picture per frame and 24 frames per second, the total is 7200 drawings for a five-minute film! ■

What would it look like if one of these patterns were painted onto a frozen lake and viewed from the air?

References

1. J.C. Beatty and K.S. Booth, *Tutorial: Computer Graphics*, IEEE Computer Society Press, Silver Spring, MD, 1982.

2. J.D. Foley and A. Van Dam, *Fundamentals Of Interactive Computer Graphics*, Addison-Wesley, Reading, MA, 1982.

3. M. Gardner, "Mathematical Games," *Scientific American*, December 1976, pp. 125-133.

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5. D.F. Rogers and J.A. Adams, *Mathematical Elements For Computer Graphics*, McGraw-Hill, New York, 1976.

6. N. Wirth, *Algorithms + Data Structures = Programs*, Prentice-Hall, Englewood Cliffs, NJ, 1976.

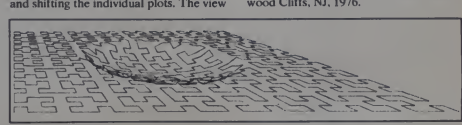


Figure 6. Hilbert order 5; wrapped around a sphere; moved right; rotated backwards with perspective.

Listing 2. Listing in C to produce a sierpinski curve.

```
/* Sierpinski curve maker.                                    */
/* each side has this shape \____/ with a short              */
/* connection between them.                                   */
/*                                                            */

main(argc,argv)
int argc;
char *argv[];
{
        FILE  *fopen();
        char *plt;
        int i,z,x0,yy0,n;
        plt = "/dev/tty2";
        fp = fopen(plt,"w");
        y = 0;
        angle = 0;
        dist = 0;
        i = 0;
        xpos = 0;
        ypos = 0;
/* go to starting position                                    */

        n= atoi(argv[1]);
        h=H0/4;
        x0= 2*h;
        yy0=3*h;
        for(z=0;z<=n;++z) {
                i++;
                x0 = x0 -h;
                h = h/2;
                yy0 = yy0 + h;
        }
        x=0;
        y = yy0;
        penup();
        moveto(x,y);
        pendown();
        side1(i);
        x=x+h;
        y=y-h;
        moveto(x,y);
        side2(i);
        x=x-h;
        y=y-h;
        moveto(x,y);
        side3(i);
        x=x-h;
        y=y+h;
        moveto(x,y);
        side4(i);
        x=x+h;
        y=y+h;
        moveto(x,y);
        fclose(fp);
}

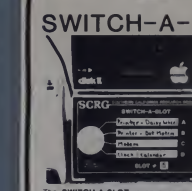
side1(i)
int i;
{
        if (i>0) {
                side1(i-1);
                x=x+h;
                y=y-h;
                moveto(x,y);
                side2(i-1);
                x=x+h;
                y=y+h;
                moveto(x,y);
                side1(i-1);
        }
}

side2(i)
int i;
{
        if (i>0) {
                side2(i-1);
                x=x-h;
                y=y-h;
                moveto(x,y);
                side3(i-1);
                y= y-2*h;
                moveto(x,y);
                side1(i-1);
                x=x+h;
                y=y-h;
                moveto(x,y);
                side2(i-1);
        }
}

side3(i)
int i;
{
        if (i>0) {
                side3(i-1);
                x=x-h;
                y=y+h;
                moveto(x,y);
                side4(i-1);
                x=x-2*h;
                moveto(x,y);
                side2(i-1);
                x=x-h;
                y=y-h;
                moveto(x,y);
                side3(i-1);
        }
}

side4(i)
int i;
{
        if (i>0) {
                side4(i-1);
                x=x+h;
                y=y+h;
                moveto(x,y);
                side1(i-1);
                y=y+2*h;
                moveto(x,y);
                side3(i-1);
                x=x+h;
                y=y+h;
                moveto(x,y);
                side4(i-1);
        }
}
```

SWITCH-A-SLOT



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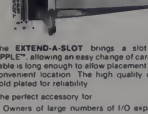

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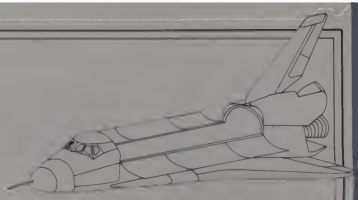

Plots About Plotters

David H. Ahl

Since this issue of *Creative Computing* is devoted largely to graphics, it seemed appropriate for our Print About Printers column to become Plots About Plotters.

We performed in-depth evaluations of two plotters, an eight-pen unit from Roland, and a single-pen unit from Enter Computer. The Roland unit is very similar to their one-pen plotter and our comments apply to both units. Enter Computer recently introduced a six-pen plotter; we have included it in the chart and have some comments about it, but we did not do a hands-on evaluation.

Of the many plotters we have evaluated over the years, seven are still the current models. Question to readers: would you like a roundup of these and all other currently available plotters in a future issue? More than just specifications, this would include our impressions and, in two cases, results from long-term use (sort of a 24,000-mile evaluation).

Roland X-Y Plotters

Roland DG Corp. manufactures two plotters, the DXY-800 (eight pens) and DXY-101 (one pen), specifically for use with microcomputers. Unique among small plotters, the units can be used in either a horizontal or vertical position. We tested the DXY-800; however, most of our comments apply to both units.

Out of the Box

Packed with the plotter are eight colored pens, four pen holders (for standard nylon-tip pens), a stand (to hold the plotter in a vertical position), a power supply, and a manual. The only thing not included are an interface cable and paper.

The plotter measures 17" x 19.5" x 3"; an external power supply has two cables, one to the plotter and one to the outlet. In the horizontal position, the plotter occupies 16" x 20" of desk space; using the heavy wire stand to put the plotter in a vertical position, the footprint shrinks to 10" x 20".

The largest paper accepted is 420 x 297mm (apparently a standard European size). The corresponding U.S. dimensions are 16.5" x 11.7"; the nearest standard size in the U.S. is 17" x 11".

Although the manual seems to suggest that plots can be drawn on the entire 420 x 297mm surface of the paper, this is not the case. The maximum area for plotting is 350 x 260mm (approx. 13.8" x 10.2"). The DXY-101 has a maximum x dimension of 370mm (14.6").

Roland DXY-800 plotter can operate in a near vertical position.

Two convenient magnetic strips hold the paper in place on the right and left. For large plots we would have appreciated additional strips for the top and bottom. These are available as extra cost options, although we found that masking tape worked just fine.

On the back of the plotter (assuming horizontal placement) are several connectors and switches. The plotter can accept input through a parallel (Centronics) or serial RS-232 port. For serial operation, DIP switches are used to select the baud rate, parity, data bits, and stop bits. We tried both interfaces and had no problems with either one.

A push button off/on power switch is found on the back. In addition, at the top right of the plotter bed are two other switches (Pen Up/Pen Down and Home) and two LEDs (Power On and Pen Up).

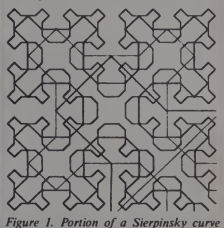

Figure 1. Portion of a Sierpinsky curve done on the Roland DXY-800. Only the PRINT *statements had to be changed in the program originally written for the Houston Instruments DMP-29.*

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and a cast appears on the screen
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and music and sound are heard
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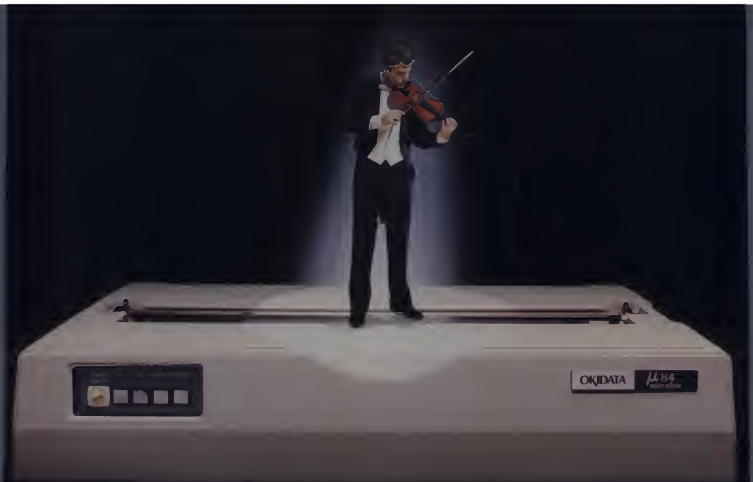

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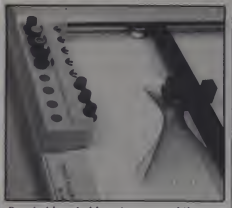


Pen holders hold active pens while pens (with their caps on) can be stored on the receptacles to the left.

Eight pen holders are at the top left of the plotter bed. Each one holds a Roland pen or a standard pen holder. We tried a Pilot Razor Point pen with good results, although we can't see any reason not to use the included pens. Included colors are black, red, blue, green, pink, orange, purple, and brown.

Plotting is accomplished by means of a vertical bar which moves from right to left with a pen holder that moves up and down along the bar. Step size is 0.1mm (0.004") and repetitive accuracy is 0.3mm (0.012"); in actual use, we found the plotter performed well within this limit, even with pen changes to other colors.

Like other plotters, the DXY-800 is fairly noisy in operation, particularly when making a series of small steps or pen up/pen down movements.

Drawing Commands

The plotter recognizes 20 commands. All commands are a single letter, although all but one require one or more arguments. Home (H) is the only single letter command; it moves the pen to the 0,0 position.

Two commands, Draw (pen down) and Move (pen up), cause the pen to move to a position specified by x-y coordinates. As there is no scaling, these coordinates must be specified in integers representing 0.1mm (max. 3500 x 2600).

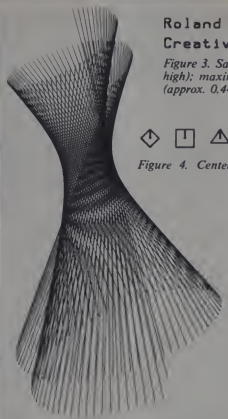


Figure 2. Rotating cone drawn with a nine-line program from page 27 of the Roland manual.

Roland DXY-800 Plotter
Creative Computing Evaluation

Figure 3. Sample print in size 3 (2.8mm high); maximum letter size is 11.2 mm (approx. 0.44").

Figure 4. Centering marks in size 12 (5.2mm square).

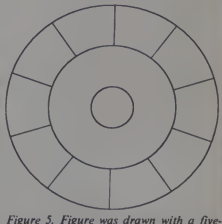


Figure 5. Figure was drawn with a five-line program; circular division lines of any length can be drawn with a single command.

The Increment command draws an incremental distance from the last pen position; the Relative command performs the same operation with the pen up.

The Line command draws solid or dashed lines with variable spacing. The Axis command draws hash marks along an x or y axis.

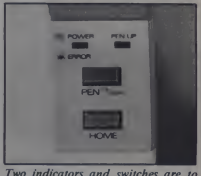
A group of four commands is used to draw alphanumeric characters and ten graph symbols in any of 15 different sizes (0.7 to 11.2mm high) and four directions (0, 90, 180, 270 degrees).

A group of four commands is used to draw circles and arcs in either absolute or relative locations. Arc angles are specified in degrees rather than radians—a welcome feature. On the other hand, these commands can draw only circles (or portions) and not ellipses (which are possible on some other plotters). A related command is "K" which draws division lines (like hash marks) in a circular pattern.

Finally, the "T" command draws hatching (series of slanted lines for shading enclosed areas) within any defined rectangular area.

This is a comprehensive command set, although compared to a plotter such as the Houston Instruments DMP-29, the

Rear panel includes serial and parallel connectors, DIP switches for setting serial protocols, and power switch.



Two indicators and switches are to the upper right of the plotting bed.

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BY ROBERT MAUNDER

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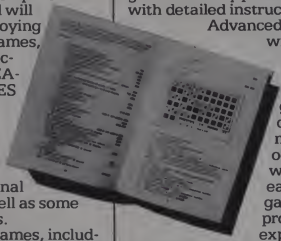

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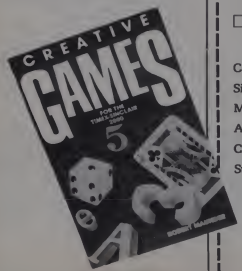

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Roland DXY units are "missing" several useful commands. Lacking, for example, are commands to reset the plotter, draw ellipses, draw different types of lines (other than solid and dashed), do scaling, change the pen speed, change the step size, and connect points of an irregular curve. Even without these commands, the Roland plotters are quite versatile; nevertheless, certain types of plots will require more programming than they would using a plotter with more built-in "intelligence."

Documentation

The Roland plotter comes with a 31-page manual which we rank as adequate—no more, no less. As far as interfacing, if you are connecting the plotter to an Apple, TRS-80, or IBM PC with standard parallel interface, the instructions are complete. (Actually, they are fine for a parallel connection to any computer, although only the above three are mentioned.) If you plan to use a serial interface, the manual provides the necessary information, although it is quite technical. IBM PC and Apple cable connections are given, but no others.

Seven pages of the manual are devoted to a short description of each command along with a short program listing and a sample plot. Our applause to Roland for including this detail, something sadly lacking in the documentation of nearly every other plotter we have evaluated.

One-half a page is devoted to describing the printer mode (using the plotter to print text); we found it inadequate. We also felt that the single page devoted to error indication and recovery could have been expanded.

Good Price Performance

While the Roland DXY-800 does not have all the features of some other plotters, neither is it as expensive. Indeed, in the under $1000 price range, the DXY-800 is one of the few plotters able to handle 11" x 17" paper and eight pens. The pen holders for standard pens are a nice plus as are the built-in parallel and serial interfaces. Furthermore, with the upright stand, it has the smallest footprint of any unit that can handle 11" x 17" paper. We can't attest to its longevity, although it appears to be ruggedly built. The bottom line: for under $1000, the Roland DXY-800 is an excellent buy.

For business graphics, Roland offers a comprehensive software package which automatically produces line, bar, and pie charts according to your specifications. Furthermore, it has the capability to read files from popular spreadsheet packages and graph the data. This package sells for $375. When it was first introduced in April, Roland offered an attractive package price which included both the plotter and software; you might want to ask your dealer if this is still available.

CIRCLE 427 ON READER SERVICE CARD

Sweet-P Model 100

The Sweet-P Model 100 "Personal Plotter" by Enter Computer Inc. is one of the smallest units on the market. It achieves its compactness by means of a novel plotting mechanism that moves the paper back and forth on precision rollers while moving the pen from side to side. As a result, it occupies only 14" x 9" of desk space, but can produce plots on 8½" x 11" paper.

Complete As It Comes

The Sweet-P plotter comes complete with everything needed for immediate operation: manual, 12 colored pens, interface cable, packet of paper, and disk of software (for Apple or IBM PC). Although the plotter is supplied with either Apple or IBM PC cable and software, it will work with any computer. In some cases you may have to use a different cable. The plotter comes with a parallel interface only.

Hint: the Apple cable will work with TRS-80 Model 100 and NEC 8201 notebook portables while the IBM cable will work with any computer with a DB-29 connector (RS-232 type) on the parallel output port. It would have been useful if Enter had made available a cable for the plotter with a standard Centronics connector for use with the many computers that have this connector.

As mentioned, the plotter is very compact. In operation, however, you must provide sufficient space in the front (5") and rear (6") for the paper to slide back and forth.

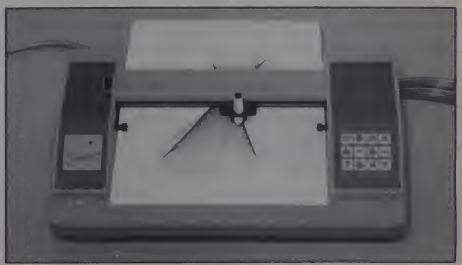
Under normal circumstances, most users will use 8½" x 11" paper. However, the mechanism is such that it can accommodate roll or fanfold paper (8½" wide). Active plot dimensions, no matter what length paper is being used, are 7.35" x 10". Step size is 0.004" and there are 2500 steps in the X direction and 1838 steps in the Y direction.

The paper is held in place by two rubber rollers at either end of the platen. We found the mechanism was equally adept at handling 50# coated stock, projector transparencies, and light layout board.

A rocker power switch is found on the left rear of the unit while a small green LED at the left front indicates when the plotter is on. On a sloping surface at the right are 12 touch sensitive switches. Nine of these switches control pen position and movement: pen up and down, move to upper right or lower left, move in one of the four directions, and accelerate pen speed. PAUSE suspends plotting activity and moves the paper out to full view position; pens may be changed at this time. SELF TEST runs a test plot, and PEN DELAY causes a pen drop delay required by some commercial pens.

Four pens are furnished in one packet (black, red, blue, and green), and eight more (no duplicate colors) are in the support pack which also includes 100 sheets of smooth finish paper.

In operation, the paper moves back and forth, and the pen from side to side. Step size, distance accuracy, and repetitive accuracy are all 0.004". Default pen speed is 5.7" per second, close to the maximum of 6"/sec. For certain types of plots, a slower speed is preferable; the Sweet-P has 16 speeds from 1.4"/sec. to 6"/sec.



Sweet-P plotter from Enter Computer Inc.

Making a Plot

As mentioned above, the Sweet-P plots points from 0 to 2500 in the X direction and from 0 to 1838 in the Y direction. Points can vary between -32,768 and +32,768 without causing errors which, in the case of plotting certain mathematical functions, simplifies the programming somewhat.

Commands are issued to the plotter in LPRINT statements. The plotter recognizes 19 commands, all of which consist of two letters; 15 require one or more arguments.

Basic plotting is done with the Draw (pen down) and Move (pen up) commands. These commands can specify an absolute x,y location or a location relative to the last pen position. A related command is Line which draws one or more lines between series of coordinates. Another related command is Point which moves the pen from its current position to a specified coordinate and makes a point mark.

Three commands control the pen: Pen Up, Pen Down, and Velocity (sets the pen speed).

The Reset command reinitializes the plotter and causes all settings to return to their default values. Home returns the pen to the home (0,0) position. Page Length sets the page length to any value between 1" and 121"; the default value is 11".

The Text command draws alphanumeric characters (numbers, letters, symbols) starting at the current pen position. The normal text delimiter (marks beginning and end of text) is a semicolon; this delimiter can be changed with the Text Delimiter command. Text can be drawn in any of 255 sizes from 0.08" high to 20.4" high and in any of the four directions (0, 90, 180, 270 degrees). We can't see too much use for very large characters, particularly since they won't even fit on the paper.

Figure 6. This graph was easily produced with an eight-line program.

The Mark command draws a specified character centered around the current pen position. This is useful to define points on a graph although, unlike many other plotters, there is no special set of graph symbols, only the standard ASCII symbols.

Two commands, Axis X and Axis Y, draw lines along the positive X or Y axis with hash marks spaced at specified intervals.

This set of commands includes several not found on other plotters; conversely, the Sweet-P lacks some commands found on other units. Most notable of the "missing" commands are those to draw circles, ellipses, and arcs; connect the points of an irregular curve; draw dashed and dotted lines; do hatching or shading; and perform automatic scaling. All of these things can be done by programming, although calculating circles and arcs can be quite cumbersome and messy.

Making up for the lack of these commands for some applications is the included disk of software (Apple or IBM PC and compatibles). This disk includes five demonstration programs, useful mainly for looking at the programming involved to produce the sample plots. Also on the disk are three graphing programs to produce line, bar, and pie charts automatically. There is also a biorhythm program and a tutorial which repeats the programming examples in the manual.

Documentation

The 48-page Operator's Manual is divided into nine sections, five of which consist of just a page or two. The first long section describes unpacking,

Figure 7. Sample print in size 7 (0.56" high); letters can be over 20" high.

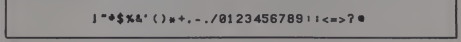


Figure 8. Numbers and symbols in character size 1 (0.08" high).

Rollers move the paper back and forth and the pen moves from side to side.

Touch panel on right has 12 plotter controls.

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Roland and Sweet-P Plotters

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Number of pens	1	8	1	6
Paper size	11 x 17"	11 x 17"	8.5 x 11"	11 x 17"
Plotting area	10.2 x 14.6"	10.2 x 13.8"	7.35 x 10"	10.2 x 16.1"
Resolution	0.004"	0.004"	0.004"	0.004"
Repetition accuracy	0.012"		0.004"	
Different pen		0.012"		0.008"
Plotting velocity (max.)	7.1"/sec.	7.1"/sec.	6"/sec.	14"/sec.
Character height (smallest, largest)	0.028" 0.441"	0.028" 0.441"	0.08" 20.4"	0.08" 20.4"
Applications software available for	IBM PC	IBM PC	IBM PC Apple II	(from third party suppliers)
Parallel interface	Centronics	Centronics	Standard	Centronics
Serial interface	RS-232	RS-232	None	RS-232
Digitizer mode	No	No	No	Yes
Dimensions (w,d,h)	19.5 x 17 x 3"	19.5 x 17 x 3"	14 x 8.5 x 3"	18 x 11.5 x 3.2"
Price	$750	$995	$795	$1095
Manufacturer	Roland DG Corp. 7200 Dominion Circle Los Angeles, CA 90040 (213) 685-5141		Enter Computer Inc. 6867 Nancy Ridge Dr. San Diego, CA 92121 (619) 450-0601	

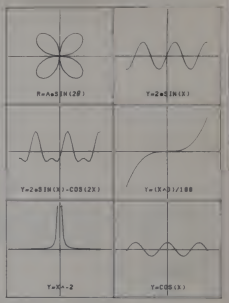


Figure 9. Demo from included software disk.

connecting, and setting up the plotter. It is well-illustrated with photos and diagrams and leaves nothing to the imagination.

A thorough description of the commands, complete with many sample programs and plots, is included in a 32-page section—one of the best we have ever seen. A similarly comprehensive section describes the contents and use of the demonstration/programming disk.

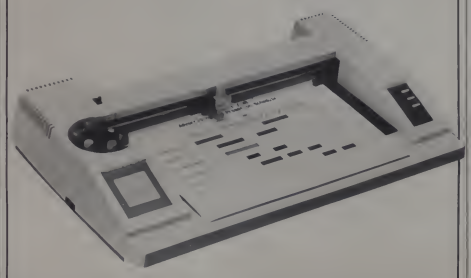
The shorter sections cover troubleshooting, maintenance, specifications, and warranty. A two-page Quick Reference Guide gives a summary of the plotter commands, conversion table (plotter units, inches, millimeters), and default settings.

Meeting Your Needs

We feel the Sweet-P Model 100 will meet the demands of the majority of people for basic business graphics. The plotter is less suitable for mathematics and engineering applications because of the 8½" x 11" paper size and the lack of circle/arc commands. Its remarkable compactness means it can be easily carried around; it fits nicely in an attaché case.

Enhancing the suitability of the Sweet-P for business applications is the Presentation Package, a $90 kit which includes 25 pieces of transparency film, 25 frames, and two sets of four colored transparency pens.

In addition to the software disk included, several third party software publishers produce software that can take advantage of the Sweet-P features. Couple all of these factors with its modest $795 price tag, and the Sweet-P Model 100 definitely goes on our recommended list.



New Six-Shooter plotter handles 11" x 17" paper and has 19 character sets built in.

A New Entry From Enter

One step up from the Sweet-P Model 100 is the new Six-Shooter Model 600 plotter from Enter Computer. We did not test this plotter; however, its specifications look most impressive.

It has both parallel and serial interfaces, and a six-pen rotary penholder, and can handle 11" x 17" paper. It has an impressive list of 54 commands including ones for automatic scaling, drawing arcs and circles, shading rectangles and wedges, and selecting alternative character sets (19 of which are built in). In addition to responding to these commands (called the Sweet-P Graphics Language), the Six-Shooter also responds to the instructions for the Hewlett Packard 7470 and several other HP plotters. As a result, there should be a fair amount of third party software immediately available for this unit.

Moreover, an additional 12 commands allow the unit to be used as a digitizer. At just $1095, the Six-Shooter certainly warrants your careful consideration. ■

CIRCLE 428 ON READER SERVICE CARD

Commodore's Port

John J. Anderson

Say yo ho, Commodorians. Hope you are getting the most of the early summer, and not spending every sunny, beautiful day cooped up inside. At least bring your C-64 out into the back yard or onto the fire escape. Or get a really long extension cord and bring it to the beach.

Don't take it in the water though. Computers can't swim.

I have received a batch of letters from new users telling me not to take them—beginners—for granted. Well let me tell you, I never thought I had. But I guess it must be true that some people get left behind when I move from easy stuff to tough stuff so quickly.

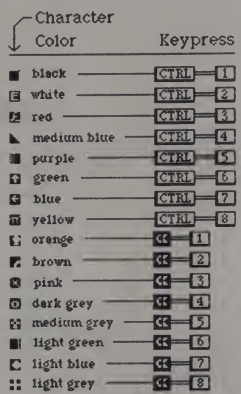
There is always so much to say, and so little room in which to say it.

Beginners, take heart. What follows is just for you. Warm up your machines and get ready to learn something fun.

Beginner's Rainbow

New owners of C-64s should type in the very short program that appears here as Listing 1. Figure 1 shows all the graphics characters of the program, and how to get them to appear on your computer. So typing the listing shouldn't be too hard,

Figure 1.



Listing 1.

```
1 REM PROGRAM 1
2 REM BEGINNER'S RAINBOW
3 REM ALSO GOOD FOR ADJUSTING MONITOR
4 REM-----------------------------------
5 POKE 53281,1:POKE 53280,1
10 FOR X=1 TO 23
20 PRINT"
30 NEXT
```

Listing 2.

```
 1 REM PROGRAM 2
 2 REM EASY ANIMATED GRAPHICS
 3 REM
 4 REM-----------------------------------
 5 POKE 53281,0:POKE 53280,0
10 PRINT"    ■■ ■ ■ 
```

Commodore's Port, continued...

Listing 5.

```
1 REM PROGRAM 5
2 REM LOOPING THROUGH
3 REM ANIMATED PATTERNS
4 REM-----------------------------------
10 FOR X=1 TO 100
20 PRINT "[graphics]";:NEXT
30 FOR X=1 TO 100
40 PRINT "[graphics]";:NEXT
50 FOR X=1 TO 100
60 PRINT "[graphics]";:NEXT
70 GOTO 10
```

Listing 6.

```
1 REM PROGRAM 6
2 REM FLASHING THE BACKGROUND
3 REM DURING EASY ANIMATION
4 REM-----------------------------------
10 FOR X=1 TO 100
15 POKE 53281,X
20 PRINT "[graphics]";:NEXT
30 FOR X=1 TO 100
35 POKE 53281,X
40 PRINT "[graphics]";:NEXT
50 FOR X=1 TO 100
55 POKE 53281,X
60 PRINT "[graphics]";:NEXT
70 GOTO 10
```

Listing 7.

```
1 REM PROGRAM 7
2 REM FLASHING THE BACKGROUND
3 REM AT A MORE REASONABLE RATE
4 REM-----------------------------------
10 X=X+1
20 IF X>20 THEN Y=Y+1
23 IF X>20 THEN X=0
25 IF Y>15 THEN Y=0
30 PRINT"[graphics]";
40 POKE 53281,Y
50 GOTO 10
```

Want your abstract to go truly nuts? POKE the value of X into the background location each time through the loop. Add the statement POKE 53281,X as lines 15, 35, and 55 in the program above. The result is Listing 6.

Talk about psychedelic! It's hard to watch *that* program run for long. A calmer multicolor background is preferable in the long run.

Listing 7 is one to experiment with. Here we have taken the concept of the *counter* and put it to use. We have set up a counting GOTO loop, using IF/THEN statements to keep the values of X and Y trimmed to our requirements. We have set up two counters—and one lives inside the other. As we move through the loop, Y counts by 1 only after X has counted by 20. This is all there is to nesting loops.

If we were to POKE location 53281 with the value of X instead of Y, the background color would change as fast as it did in our psychedelic program. But Y counts more slowly, allowing the background color to change at a much more restful pace.

Line 10 sets up the X counter, just as it did in our earliest print program. Line 20 says that when X has counted to 20, Y can count once. Only if X is about to become 21 can Y increase by one.

Line 23 says to reset X to 0 once it has counted past 20. Then it starts counting all over again. Line 25 says to reset Y when it reaches past 15. Just as in our color changing program, we want to go back to black once we have cycled through all the available colors.

Line 30 contains our abstract pattern. Don't forget the semicolon after the closing quote mark. Line 40 sets the background color to the value of Y. Line 50 sends us back to the beginning, to start all over again. We add one to X, and go through the loop again.

That's all there is to it!

News from the Wire

Space for just a few quickie announcements this time around. Next time, we

commodore 64

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Commodore's Port, continued...

will devote more space to new product announcements.

MicroProse

Solo Flight from MicroProse is a flight simulator designed with fun in mind. It is easier to fly than Sublogic's *Flight Simulator*, and though its graphics are not quite as advanced as Sublogic's, it is more fun to play.

For whatever it is worth, this is the first flight simulator I have managed to land successfully in. After three dozen crashes, this was a very gratifying experience.

You are placed in the cockpit of a light plane with full instrumentation. You can practice landings and choose weather conditions—even night flight. An air mail game lets you practice at various airports under various conditions.

Look for a full review of *Solo Flight* in an upcoming games roundup.

Precision Software

Superbase 64 is a professional database management and retrieval system for the Commodore 64. It offers an unlimited number of databases, with up to 15 files per database. Each record can hold up to 1108 characters, with a maximum of 127 fields.

The system includes search and sort capabilities, and a user interface that is quick and easy to use, with multiple on-line help screens. *Superbase 64* handles arithmetic as well as calendar calculations. It allows the sophisticated user to create customized applications packages within the Superbase 64 environment.

The program lists for $100 and requires a single disk drive.

CardCo

The CardCo C/?+G printer interface has a very strange name, but does a terrific job translating from Commodore serial to Centronics parallel printer code.

The C/?+G retails for $90 and requires no software. It includes all necessary cabling and prints the full Commodore character set including *all* Commodore graphics characters, reversed characters, and reversed graphics characters. There are many similar interfaces on the market, but few can make that claim.

The CardCo interface works with all Epson MX, FX, and RX printers, as well as the Star Gemini and Delta-10; Prowriter; C. Itoh 8510; NEC 8023; Okidata 82, 83, 84, 92, 93, and 94; Mannesmann-Tally Spirit and MT-160; Seikosha GX-100, BMC BX-80, Gorilla Banana; and other parallel printers.

Okay, that's all for now. Catch you next time. And get some sun!

Firms Mentioned in This Column

MicroProse Software
10616 Beaver Dam Rd.
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(301) 667-1151

Precision Software Inc.
820 Second Ave, Suite 110
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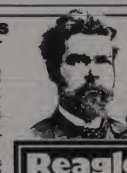
5 LIST: LIST: LIST: LIST: LIST
6 FOR C = 1 TO 40: POKE 33,C: PRINT: NEXT: GOTO 5



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AD #188

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Let's Talk Business

Dale Blanchard

Last month I said I would discuss some traps to watch out for as you adopt word processing. I also said I would discuss some specific word processing programs. I think I'm really going to do it this time.

First, though, I'd like to give a little history of my involvement with word processing. As I mentioned in my April column, I became the typist for my newly formed company when my wife refused to get sucked into it. That led to the purchase of our first word processing machine, an OCI Veritext, a machine we named Vivian.

In those days, 1976, there was a slightly different vocabulary associated with word processing. There were "blind" word processors and there were those with editing screens. Vivian was a blind machine. You typed on her as you would on a typewriter, made your corrections, and when you thought you had everything the way you wanted it, you put in new paper and ran a copy. Vivian was full of surprises. Often the corrections you thought you had made in the right places were in the wrong places altogether and some very interesting sentences resulted.

We bought Vivian in April. By July we had grown enough that I decided we needed a secretary. Enter Cheryl. Cheryl was a delight to have around. She was great on the telephone; clients loved her; the other employees loved her as well; but like many who graduated from high school in the early 70s, Cheryl could not spell. In fact I often wondered if she had any grasp of the English language at all.

We used to collect Cherylisms. It has been a long time, and I can't remember many of them, but how about "toe truck"? And when a vocational counselor is writing about an intelligence test and gets back, "Mr. Jones's eye cue score was" you can bet things will be a bit disrupted for a while.

The Word Processing Trap

Between Vivian's surprises with corrections and Cheryl's spelling and Cherylisms, I fell into the first trap of word processing. I instituted proofreading. The professional staff would dictate their reports and letters, Cheryl would type them and give them back. The staff members would proofread them and give them back to Cheryl for more corrections. Then as a final step I would have the reports and letters routed through me for a final read.

We had one staff member who would write a two-page report and then add another page at correction time.

In the beginning, when there were only two professional staff members, that was tolerable, but two things happened. First, we added more staff members, so more hours slipped down the drain. But worse than that, the professionals began to dictate in rough draft. Since they were going to have to read their reports again anyway, they stopped worrying about sentence structure and often about content. They would fix it when they proofread. We had one staff member who would write a two-page report and then add another page at correction time. Then, since he had made so many corrections, he would need to see the report again. More corrections. Cheryl hated him.

I allowed all this to happen through clever rationalization. If we let the professional staff members spend less time dictating, that would free them for more billable hours. Let's not burden these productive people with mundane details such as spelling and sentence structure. Under that theory I hired another proofreader. Mary was great; she could spell, and she knew grammar as much as anyone can know English grammar, but she hated to make decisions.

The reports we were sending were legally quite sensitive. What we said in them could obligate insurance companies to thousands of dollars of expense, or they could deprive an injured worker of years of benefits to which he was entitled. Those reports had to be right. Mary did not want to take responsibility for what was in those reports. She began to pass them on to me for final approval. So what did I have now? I had added another layer of bureaucracy. Can you believe bureaucracy in a company of six employees?

This was now our procedure:

1.) The staff member would dictate the report.

2.) Cheryl would type it.

3.) The staff member would proofread it and send it back to Cheryl for corrections.

4.) Cheryl would make the corrections.

5.) Depending on what the staff member had done, Cheryl would either send

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Business, continued...

the report on to Mary or we would go through steps 3 and 4 again.

6.) Mary would proofread the report looking for spelling and grammar mistakes as well as sensitive content issues. Mary would send it back to Cheryl for more corrections.

7.) Cheryl would make the corrections.

8.) Depending on what Mary wanted, Cheryl would either send the report on to me, or we would go through steps 6 and 7 again.

9.) I would read the report looking for sensitive content issues and send it to Cheryl for corrections.

10.) Cheryl would make the corrections and return the report to the original staff member for signature. Heaven help us if the staff member decided to make changes at that point because if he did, that sent us right back to number 3.

We had a bureaucratic mess on our hands. Not only that, we were playing "Billy Goat Gruff." Remember the story your mother read you when you were little about the goats that wanted to cross the bridge? When the first billy goat got to the bridge, a troll came out and said he was going to eat the billy goat up. The little goat persuaded the troll to wait for the next billy goat who was bigger. When the next goat got there he persuaded the troll to wait for the next one and so on.

After a while Cheryl's wild guesses became just close enough that I no longer knew whether words were spelled right or not.

We were doing the same thing in our little company. If Cheryl didn't know how to spell a word, which happened often, she would take a wild guess at it anyway. "The person who dictated it will catch it if it's wrong," she would say to herself. The person who dictated it would look at it and say, "Mary will catch it if it's wrong." Mary would look at it and say, "Dale will catch it." And my spelling went to hell in a basket.

There was a time when I was a good speller. In the beginning, after Cheryl came on board, it wasn't too bad, but after a while Cheryl's wild guesses became just close enough that I no longer knew whether words were spelled right or not. Cheryl had wrecked my spelling.

We had meetings. "It takes less time to do it right the first time," I would say, "than to go back and fix it later."

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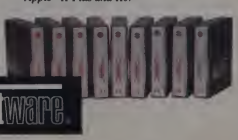

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Business, continued...

"You saw that on a poster," they countered. They were right, I had seen it on a poster.

We had more meetings. "You know how companies without word processing handle their reports?" I asked. "They just dictate them and send them," I said, answering my own question. "The person who dictates the report never sees it again. The secretary types it, signs the dictator's name to it and sends it out. That's all there is to it."

"But our reputation is that we have the best reports in the business," they countered.

"Yes," I answered, "and that's how we'll be remembered. 'That company had beautiful reports; I wonder why they went bankrupt.' "

Some Word Processing Programs

Eventually Vivian, our blind, dedicated word processor, couldn't keep up and was retired to the back room. There is a story there that I may tell someday, but I have promised to talk about some specific word processing programs, and I will.

At the time we bought Vivian almost all word processors were hard wired. That is, the word processing program was built into the machine. Even back then when I knew next to nothing about computers, I knew that concept was wrong. What if someone comes up with a better idea? There is no way to get it into the machine.

Enter Lanier. I was reading a word processing newsletter one day and came across a paragraph which said Lanier Business Systems had announced a word processor with the program on a floppy disk. I looked up their number in the phone book and the next day a salesman was in my office. A week later I was the proud owner of a Lanier No Problem word processor. I hadn't thought of it before, but do you suppose there was a time when computer companies didn't announce products until they actually had them? If we were to re-enact that scene today, I wouldn't get my machine for at least six months, maybe a year.

As the No Problem came, it had only two programs, one to repaginate (it took me a while to figure out what that word meant) and a list/merge program. There were other programs in the works and as they became available, I would get a chance to see them.

Although the technology of that machine is several years old, the word processing program which came with it is still the one I hold up for all other programs to be compared against. It had on-screen underlining. It had a very good delete function with which you could define what you were going to delete and that which you had designated for alphabet heaven was highlighted on the screen. Its move function did the same thing. But the main thing I liked about it was that what you saw on the screen was what you got on the paper. Also you could print either from the screen or from a disk file.

Its main drawback was that it was a page-oriented program as opposed to a document-oriented program. You got only 99 lines on a page, and then you had to store that on disk and start the next page. That made it cumbersome to go back and review what was on previous pages. That 99-line limitation was in part a function of limited memory. In those days memory was expensive and most computers had only 32K of RAM. The Lanier No Problem was a 32K machine and both the program and the document you were working on had to be in memory at the same time. To get around these shortcomings the Lanier would repaginate, that is, take your original document and break it up into pages of the length you wanted.

In 1980 I decided that the world was being taken over by computers and if I wanted to in any sense be in control of my life I had best learn more about them. I bought an Intertec Superbrain. Based on much research, I also bought *Wordstar* from MicroPro.

After using the very friendly Lanier program I hated *Wordstar*. I didn't get on-screen underlining. I had to learn arcane control sequences to do things for which the Lanier gave me dedicated keys. Two of these were named SCREEN and DELETE. If I want to delete something I pressed SCREEN DELETE and then defined what I wanted to delete. I could delete a word, a paragraph, several paragraphs or remainder. If I wanted to delete something which didn't meet any of those definitions I could press SCREEN DELETE and then hold down a cursor key until what I wanted to take out was highlighted. Then I pressed EXECUTE.

In *Wordstar* I could delete only characters, words, or lines unless I wanted to put block markers at the beginning and end of what I was going to delete. Even then I didn't get to see it highlighted. I later learned that was the fault of the Superbrain, not *Wordstar*.

Moving text on the Lanier was much like deleting it. I could define what I wanted to move, and as I did so, it became highlighted on the screen. In *Wordstar* I again had to put block markers at the beginning and end of what I wanted to move.

There were two other features of the Lanier which *I* resented losing in *Wordstar*. First, on the Lanier my margins, tab settings, and character and line

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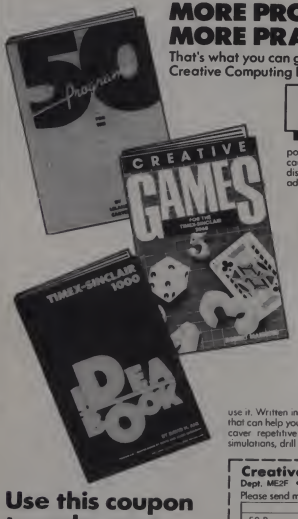

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Business, continued...

spacing were all stored invisibly with my documents. In *Wordstar* when the program was loaded I got its default values. Since those rarely matched what I wanted, I had to reset my own values each time I worked on a document.

But by far the biggest loss in the switch from the Lanier to *Wordstar* was that I lost my on-screen math capabilities. The Lanier had a truly elegant program, which in its final form was known as Mathmaster. You could type columns of figures and then right there do math calculations on them. For example, you could type a column of figures, put your cursor on the top number of the column, press SCREEN A C (screen add column), and instantly you had the total of the column. If you wanted the total put at the bottom of the column, you pushed T and the total was printed on the screen right where it belonged. With this same program I could also multiply, divide, and do percentages. *Wordstar* had nothing even remotely resembling that capability.

Lanier has gone through many changes since those good old days and I have lost track of what they are doing. I know they have some new machines out with new programs and I suspect they are very competently handled. I suppose I should try to find out so that, if for no other reason, I can write intelligently about them.

My adventures with *Wordstar* have continued, and most of my early objections have been overcome, both through improvements in *Wordstar* and through improvements in my own knowledge. For example, one of the main reasons the Lanier program was easier to use than *Wordstar* was that it had dedicated function keys. Most computers now have function keys which can be assigned to specific *Wordstar* functions, which makes the program much more friendly. It still doesn't have on-screen underlining, still doesn't invisibly store my formatting information with my documents, and still doesn't provide the math capabilities that my Lanier had. In spite of that I do use *Wordstar* for much of what I do.

But I don't use it for writing this column. Instead I use *Spellbinder* from Lexisoft. I suspect I am safe in saying that *Wordstar* and *Spellbinder* are among the best known, if not the two best known, word processing programs on the market. I think they are both very good programs, with each having some advantages over the other. The bottom line of why I use *Spellbinder* for writing this column is that I can print from the screen. I like to do a final proofread as the pages come off the printer. If I find something I want to change, I can do it on the spot, reprint the page and go on from there. *Wordstar* is a bit more cumbersome.

The tradeoff is that I have to print from the screen. In *Wordstar* I had to print from the file, but at the same time I could be working on something new on the screen. For me that is not a real advantage, because I have never been either organized enough or smart enough to split my attention between two tasks.

Well, I see that I have done it again; run out of space before I have run out of words. However, as promised, I really did talk about a couple of word processing programs. Your Honor, I would like it noted in the record that I did talk about some word processing programs.

Next Month

Next month I'll try to do a little more comparison of *Wordstar* and *Spellbinder*. Then I want to talk about *Catalog* from SRX. If I have space, I'll try to get to *Mite* from Mycroft. ■

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Let the Machine Demo Itself

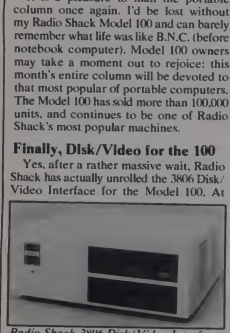
Notebook Computing

John Anderson

It is a pleasure to man the portable column once again. I'd be lost without my Radio Shack Model 100 and can barely remember what life was like B.N.C. (before notebook computer). Model 100 owners may take a moment out to rejoice: this month's entire column will be devoted to that most popular of portable computers. The Model 100 has sold more than 100,000 units, and continues to be one of Radio Shack's most popular machines.

Finally, Disk/Video for the 100

Yes, after a rather massive wait, Radio Shack has actually unrolled the 3806 Disk/Video Interface for the Model 100. At



Radio Shack 3806 Disk/Video Interface.

$800, it provides a 40- or 80-column video signal, as well as a 184K half-height 5¼" disk drive. This may seem a bit pricey, and it is. But for those in dire need of mass storage and without download access to another computer, it is an overdue godsend. The ability to bypass the LCD for a video display makes the Model 100 faster and easier to work with. We will present a complete evaluation of the Disk/Video Interface in an upcoming column.

Model 100 Book Beat

It has taken six months or so for the microcomputer industry to catch up with the needs of the burgeoning portable field. Now, at last, valuable books for the Model 100 owner have begun to surface. Here is a roster of the best I have seen so far:

• *The TRS-80 Model 100 Portable Computer* by David A. Lien. 555 pp. Compusoft Publishing, P.O. Box 19669, San Diego, CA 92119. $19.95. The acknowledged master of TRS-80 legerdemain sets his sights on the Model 100. Lien wrote the original light-hearted manual for the TRS-80 Model 1, which got me excited about computers way back in 1978. He has a light, amusing, but highly focused style, and an uncanny ability to impart complex concepts painlessly. Profusely illustrated, thoroughly indexed, and chock full of meaty programming examples. To my mind a bookshelf must for Model 100 owners.

• *The Model 100 Book: A Guide to Portable Computing* by Jonathan Erickson and Robert J. Sayre. 310 pp. Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710. $14.95. An excellent companion for Lien's book, this work explains in plain language the types of benefits the Model 100 can provide and backs up its suggestions with solid Basic code. Uses a chatty, informal style to outline use of the Model 100 in the home, office, and classroom. Right on the beam in its section about using the computer on the road, and includes neat programs like a foreign language dictionary and currency conversion. Also includes valuable information on telecommunications potential of the machine.

• *The TRS-80 Model 100 Ideabook* by David H. Ahl. 141 pp. Creative Computing Press, 39 East Hanover Ave., Morris Plains, NJ 07950. $8.95. Banish the thought—I did not include this entry because my boss told me so. I included it rather because it contains 50 classic programs ready-to-run on the Model 100. These include problem-solving, drill and practice, function-plotting, probability, geometry, science, and of course, games. The classics, Lunar Lander and Hammurabi, are there, in all their glory, but formatted for the LCD. And nothing can teach you Basic quicker than learning how these simple programs run. My early interest in micros is attributable directly to Mssrs. Ahl and Lien.

The ability to bypass the LCD for a video display makes the Model 100 faster and easier to work with.

• *The Model 100 Companion* by the Editors of Osborne/McGraw-Hill. 116 pp. Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710. $14.95. A collection of 27 programs including applications, entertainment, and utilities. Games include a nice music maker and the classic Towers of Hanoi puzzle. Utilities include a Basic renumber program, listing format program, and a really neat program called Invisible System, which removes the filenames of the ROM-based software from listing in the Menu program. As a result, you can add five extra filenames of your own.

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Notebook Computing, continued...

You can still enter Basic, Text, Telcom, Addrss, and Schedl—by typing the name of the ROM-based program you want, and hitting ENTER—very handy.

The book also gives detailed instructions for downloading programs from CompuServe. The utilities are very useful and excellently annotated. Beginning Model 100 owners will certainly want to check out this book.

Book Beat Doggie

It is my unfortunate duty to warn you off *All About Hand-Held and Briefcase-Portable Computers* by C. Louis Hohenstein. 368 pp. Byte Books, McGraw-Hill Paperbacks, 1221 Avenue of the Americas, New York, NY 10020. $9.95.

The book needlessly and unproductively blurs the line between handheld and portable computers, and provides a nearly worthless overview that helps neither the portable owner nor the portable shopper. Its highly uneven approach explains things like keyboards as if we had never seen one before, then later on provides an exploded view of the Sharp PC-1500—not to study the architecture, but more or less just for the hell of it.

A quote: "In the hand-held computers we're using as examples, the visual display is usually located above the keyboard, near the top of the computer faceplate." Things deteriorate from there. With a straight face the author compares the $7000 Grid Compass with the $70 TRS-80 PC-1.

Generally a mess. McGraw-Hill ought to know better, but then again, nobody's perfect. In any case, stay away from this one. It's a major doggie.

Model 100 Microcassette Fix

In the November 1983 issue of *Creative Computing*, Glenn Hart gave a favorable review to the Olympus C100 Microcassette Recorder. He noted in his review that the supposedly "portable" cassette recorders used by some portable computer owners as storage devices were heavier and bulkier than the portables themselves. He was extremely impressed by the C100, which at 5.4" by 2.6" by 1.1" is smaller than a pack of cigarettes. It is one of a growing number of microcassette dictation

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Olympus C100 Microcassette.

recorders that can meet the demands of data storage.

When it came to the Model 100, however, the C100 did not perform well. Hart concluded that the 1500 baud transfer rate proved too much for the Olympus recorder and left it at that. He went on to recommend the recorder highly for TRS-80 PC-1 and PC-2 owners, as well as owners of equivalent Sharp handhelds.

Well it is time for an update and a clarification. The reason the C100 proved incompatible with the Model 100 was not a matter of baud rate. The reason for the incompatibility of the C100 and many other recorders with the same problem, is the lack of an AUX input jack. When Model 100 input—designed to go into an auxiliary jack—is routed instead to a MIC input jack, the signal becomes badly distorted from overload. It will not load properly. The fact that Glenn Hart got any programs to load to the Model 100 is amazing and a tribute to his patience.

Peter Cronin, of Montvale, NJ, wrote with a fix that will allow the C100 and many other recorders to work with the Model 100.

The solution, confirmed by several members of the Model 100 Special Interest Group (SIG) on Compuserve, is the addition of a simple attenuator circuit between the input lead and the MIC input jack on the recorder. The adaptor is as simple as a 3.3K ohm resistor attached in a series with a .01 MFD capacitor on the signal (hot) input lead. Attach a 390 ohm resistor to the braided (ground) lead (see Figure 1). Cronin gives the following hints about assembly:

"The components can be installed in a short 'extension cord' for the wire going into the MIC input and must be shielded in accordance with good electronic practice. It is also a good idea to keep the recorder a foot or so away from the computer. Many Model 100 owners are successfully using this adaptor with a variety of cassette and microcassette recorders."

Thanks for the under $5 fix, Peter, and keep in touch.

For $125, the C100 is thus transformed into an extremely compact and reliable Model 100 storage peripheral. Olympus offers a special microcassette tape especially for data storage, 15 minutes long, and retailing for $2.20. For more information contact Olympus, 4 Nevada Dr., Lake Success, NY 11042. (516) 488-3880.

Let the Machine Demo Itself

Whenever I pull out the Model 100 on a plane, at a news conference, or during an interview, people ask questions about it. When I hand it to them, they stare at the screen and say "wow," but that's about it. I took the time to write a short demo, that lets the Model 100 tell about itself instead of making me do it. It can do a much better job, anyway.

Listing 1 is a version of that demo. It struts a bit of graphics and sound, as well as listing the important features of the machine. It hints at the kinds of powers the machine commands, and at the same time keeps the whole thing light. It takes up about 3K.

Novice programmers can learn a little bit from this listing. The random line and box displays (lines 150-270) are very simple graphics demos and could be improved with very little work. The sound demo (lines 350-390) is bare bones, but shows how easy it is to get the Model 100 to play a little tune. Lines 410 to 460 comprise a self-portrait, and are easily transportable to other programs.

You might also explore the use of PRINT AT commands to place the cursor on the screen. Simplicity itself—and the effect is quite nice.

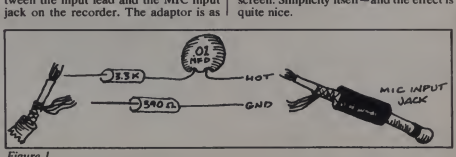

Figure 1.

Listing 1.

```
10 'Model 100 Demo Program
20 'by John Anderson
30 '2/12/84 Creative Computing
40 '-------------------------
110 CLS:PRINT:PRINT" The TRS-80 Model
100:":GOSUB 2000
120 PRINT:PRINT" The first truly
practical portable...":GOSUB 2000
130 PRINT:PRINT " And a computer to be
reckoned with!":GOSUB 2020
140 FOR A=1 TO 60:SOUND 6000,1:SOUND
8000,1:NEXT A
150 CLS:FOR E=1 TO 25
160 A=INT(RND(1)*238)
170 B=INT(RND(1)*62)
180 C=INT(RND(1)*238)
190 D=INT(RND(1)*62)
200 LINE (A,B)-(C,D)
210 NEXT E:CLS
220 FOR E=1 TO 15
230 A=INT(RND(1)*238)
240 B=INT(RND(1)*62)
250 C=INT(RND(1)*238)
260 D=INT(RND(1)*62)
270 LINE (A,B)-(C,D),1,B
280 NEXT:CLS:PRINT"Dear Jerry,":GOSUB
2000:PRINT:PRINT"      It was good
meeting with you last"
290 PRINT"Thursday.";:GOSUB 2000:PRINT"
I'm sure that InfoCo":PRINT"will be a
great success. Best of luck."
300 GOSUB 2000:PRINT:PRINT"
Sincerely,"
310 GOSUB
2000:PRINT@5,"Bernard,":PRINT@144,"Warth
og Inc."
320 GOSUB 2000:PRINT@5,"Rodney,
":PRINT@144,"Zwicky Bros."
330 GOSUB
2000:PRINT@5,"Juanita,":PRINT@144,"Squea
ko Ltd.":
335 GOSUB
2000:PRINT@5,"Herbert,":PRINT@144,"Syntr
onics Co.":GOSUB 2000:GOSUB 2010
340 CLS:PRINT:PRINT:PRINT:PRINT" It can
even play music!"
350 READ A:IF A<0 THEN 400
360 SOUND A,9
370 GOTO 1250
380 DATA
12538,9394,8368,7456,7456,8368,7032,7456
,11172,12538,7456,9394,8368,11172,12538,
9952,9394
390 DATA
6269,6269,7032,7456,8368,7456,8368,9394,
9952,11172,12538,11172,9952,9394,9952,93
94,8368,7456,8368,9394,-999
400 CLS
410 LINE (20,20)-(90,60),1,B
420 LINE (26,24)-(77,34),1,BF
430 LINE (80,25)-(84,31),1,BF
440 LINE (23,40)-(87,54),1,BF
450 LINE (29,56)-(77,58),1,BF
460 LINE (23,37)-(87,38),1,BF
480 LINE (170,5)-(230,35),1,B
490 PRINT@110,"cassette"
500 LINE (100,10)-(160,60),1,B
510 PRINT@179,"printer"
520 LINE (25,20)-(25,7),1:LINE
(25,7)-(170,7),1
530
LINE(31,20)-(31,12),1:LINE(31,12)-(100,1
2),1
540 PRINT@245,"Model 100"
550 GOSUB 2000:GOSUB 2000
560 CLS:PRINT:PRINT" *** Full-stroke
keyboard":GOSUB2000:PRINT:PRINT" ***
Built-in modem and phone dialer":GOSUB
2000
570 PRINT:PRINT" *** ROM software
packages:":GOSUB 2020:GOSUB 2000
580 PRINT@ 227,"Text editing":GOSUB 2000
585 PRINT@ 227,"Terminal    ":GOSUB 2000
590 PRINT@ 227,"Address File":GOSUB 2000
600 PRINT@ 227,"Scheduler   ":GOSUB 2000
610 PRINT@227,"Basic       ":GOSUB 2000
620 CLS:PRINT:PRINT" *** Bar code reader
jack":GOSUB 2000:PRINT:PRINT" *** Eight
programmable-function keys":GOSUB 2000
630 PRINT:PRINT" *** Non-volatile CMOS
RAM user memory":GOSUB 2020:GOSUB
2000:GOSUB 2010
640 CLS:PRINT:PRINT" *** Built-in
calendar and clock":GOSUB
2000:PRINT:PRINT" *** Low battery
drain":GOSUB 2000
650 PRINT:PRINT" *** RS-232 port for
communication":GOSUB 2020:GOSUB
2000:GOSUB 2010
660 CLS:PRINT:PRINT:PRINT" Ask the
person who is":PRINT" showing it to
you":PRINT" to tell you more!":GOSUB
2000
1000 MENU
2000 FOR A=1 TO 1000:NEXT A:RETURN
2010 FOR A=1 TO 300:NEXT A:RETURN
2020 LINE (6,55)-(234,55),1:RETURN
```

"We're about to land—please tell your friend to buckle up."

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Notebook Computing, continued...

Listing 2.

```
10 'Word Counter Program
20 'by John J. Anderson
30 '3/5/84 Creative Computing
40 '-------------------------
100 CLEAR 5000:W=0
110 CLS:PRINT:FILES
120 PRINT:PRINT "File name (must be .DO
file)";N$
130 CLS:PRINT:PRINT"An exact count takes
 a lot of time.":PRINT"An approximate
count is quicker.":PRINTSTRING$(39,"-")
150 PRINT:PRINT"(E)xact or (A)pproximate
count:"
160 I$=INKEY$
170 IF I$="e" THEN 300
180 IF I$="a" THEN 250
190 GOTO 160
250 ON ERROR GOTO 500:OPEN N$ FOR INPUT
AS
1:CLS:PRINT:PRINT"Working...":PRINTSTRIN
G$(39,"-")
255 IF EOF(1) THEN 270
260 INPUT #1,A$:W=W+15:GOTO 255
270 CLOSE 1:BEEP:PRINT"File (" N$;")
contains approximately":PRINT:PRINT"
";W;"words.":
280 PRINT:PRINT"(M) for menu, (SPACEBAR)
to rerun.";
290 I$=INKEY$:IF I$="m" THEN MENU
295 IF I$=" " THEN RUN
297 GOTO 290
300 ON ERROR GOTO
500:CLS:PRINT:PRINT"Working...":PRINTSTR
ING$(39,"-"):OPEN N$ FOR INPUT AS 1:W=1
310 A$=INPUT$(1,1):Z$=Z$+A$:N=N+1
320 IF N)3 THEN Z$=RIGHT$(Z$,3)
330 IF EOF(1) THEN 380
340 IF A$=CHR$(10) THEN W=W+1
350 IF LEFT$(Z$,1)()CHR$(32) AND
MID$(Z$,2,1)=CHR$(32) AND
RIGHT$(Z$,1)()CHR$(32) THEN W=W+1
360 PRINT @213,W;
370 GOTO 310
380 CLOSE 1:BEEP:PRINT@ 120,"File
("N$;") contains
exactly":PRINT@219,"words."
390 PRINT:PRINT"(M) for menu, (SPACEBAR)
to rerun.";
400 I$=INKEY$:IF I$="m" THEN MENU
410 IF I$=" " THEN RUN
420 GOTO 400
500 CLS:PRINT:PRINT:PRINT"
IMPROPER FILE NAME:":FOR X=1 TO
1000:NEXT X:RESUME 110
```


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Counting Words

Another program I keep in precious RAM most of the time is the word counter which appears here as Listing 2. The number one job my Model 100 performs is word processing, and when I am writing reviews and columns, I need to know just how long they are. This program lets me get a quick, approximate count, or a slow but exact word count.

When you run it, the program asks you which file to count and traps for errors. It contains two routines—the first approximates a count by counting only lines, and then using a round figure of 15 words per 80-column line to estimate an answer. If you have a higher fog index (use bigger words) than I do, try a lower number in line 260. If you are monosyllabic, increase that number. For my vocabulary, I find that 15 words per 80-column line is a good rule of thumb. For example, this paragraph and the ones preceding and following it come to a total of exactly 292 words. Using the approximation routine, you come up with a figure of 285, which is quite acceptable for most needs.

Why an approximation routine at all? Because counting words exactly takes up a whole lot of time on the Model 100. Using the second routine, counting this paragraph and the two before it takes a minute and 40 seconds. That may not look like much at first glance, but imagine what happens when you get up into the realm of 2000+ words. Most of the time it is better to use five minutes revising your text than waiting for an exact word count. That's why the approximation method gets more frequent use. It counts up these last three paragraphs in under three seconds.

Of course when you count words exactly on a computer, you really count the spaces between words. That is what is happening in lines 310-370. At the end of the program you can either get a word count on another file or to exit back to the menu.

Keep In Touch

Dave and I very much enjoy hearing from you portable owners—keep the cards and letters coming in. Send in a tape of your latest game, demo, or artistic creation.

Anybody out there want to save us the trouble of writing an LCD graphics screen-save routine? We'll print it here, if it is short enough and sweet enough. Anybody figured out how to disable the break key? Give us a call. We'll credit the secret to you.

Until next time, keep your penlights fresh, your nicads charged, and your LCD out of direct sunlight. See you same place next time. ■

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At the heart of the package is the Roland DG DXY-800 X-Y Plotter, (the lowest priced 8-pen plotter on the market). The DXY-800 is an 8-pen intelligent plotter offering an 11" x 17" plot bed, Centronics parallel and RS-232 serial interfaces, and can also be used in either a horizontal or vertical (60 degree inclined) position, to conserve your desk-top space. Use regular paper or even acetate to produce overhead projection graphics.

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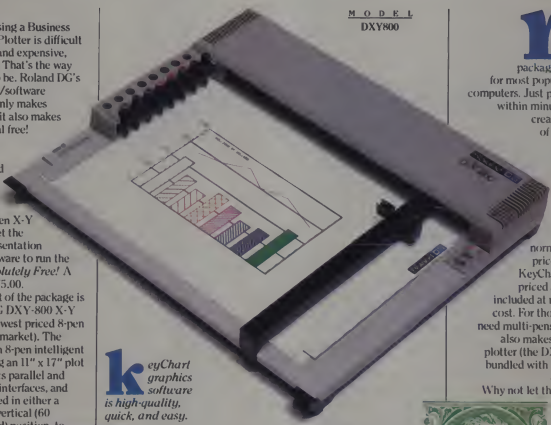
DXY800



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Why not let the Roland DG graphics system improve the quality of your business presentations? But you'd better hurry, this kind of free and easy dealing isn't going to last forever, just until June 30th. For a dealer near you contact: Roland DG, 7200 Dominion Circle, Los Angeles, CA 90040, (213) 685-5141.

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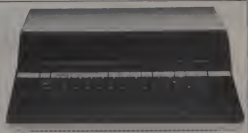

Outpost: Atari

Arthur Leyenberger and David Small

In this month's Outpost, an old friend, David Small, shares the honors with columnist Art Leyenberger. David brings us news gleaned from a recent visit to Atari, and Art talks about new books of interest to Atari users.

David starts:

In March, I visited Atari to try to make some sense of what I had been hearing about the company and its products. Among the people with whom I spoke there was Sherwin Gooch, a manager and the driving force behind the 1450 XLD.

"What?" you ask. "The 1450 has been cancelled." Ah, read on. And remember you heard it here first.

Sherwin is the head of a small, very talented group of people working on the 1450. When I visited, they were putting the final touches on the design. In spite of parts availability problems, politics, layoffs, and resignations, Sherwin hung on, dedicated not only to doing a fine machine design, but, in his words, to "getting the 1450 out the door. That is what computer companies are judged by, not the rumors of grandiose machines 'under development,' but what goes out the door. And if it kills me, the 1450 XLD is going to get out the door." When? He could not say, officially; I will say June. This year.

And my, what Sherwin has wrought. This machine can sing! That's right. And talk—better than any speech synthesizer you have heard. It can also answer your phone with its speech synthesizer. Or dial the phone itself and use a built-in modem.

The internal processor is still the 6502, not a 16-bit variation (as rumor had it), the onboard memory is 64K (not 128K), and on-board Basic is supplied.

Disk drives? I bet every Atari owner wants speed and more storage on the disk. The 1450 has true parallel double sided, double density disk drives, with 256-byte sectors. This gives around 360K of data per disk, and access to it is very, very fast; it takes just 36 seconds to transfer the data from the entire disk into memory. A disk copy takes twice that, or 72 seconds.

The operating system is very sophisticated, yet manages to stay compatible with software for the 400/800 series machines. This is an extremely significant and intelligent move; it means that the 1450 will be able to run all sorts of software at the time it hits the market.

When I was at Atari, I saw Sherwin working through an idea to make the output from POKEY (the sound chip) be the input to the speech synthesizer, so you could get a really neat "talking sound" effect. I don't know if this will be included or not; the machine was near "close date," the time when things are not supposed to be changed. If if is there, you will surely see some really neat software using this effect—just as soon as software houses figure out how it works.

APEX Discontinued

Some other changes at Atari include the dropping of APEX, the Atari Program Exchange. This was a low cost distribution center for user written Atari software. Unfortunately, it was too "low cost"; Atari did not make much money from it. And that is why APEX was dropped.

The top 20 or so APEX titles will still be sold, but the rest of the products will be shelved. Since the original authors retain rights, they can be distributed elsewhere.

Kudos to Fred Thorlin, the manager of APEX for all this time; he helped many people publish their first programs and got a wide variety of software "out the door." Fred is no longer with Atari, but his contribution should not be forgotten.

Star Network

Another interesting Atari product you may be hearing about is the Star network. The Star allows up to 64 Atari computers to be tied to a few common disk drives and printers. This makes it absolutely ideal for classroom situations, for it means a group of students can share a resource.

The Star was originally developed by MECC (Minnesota Educational Computing Consortium) and Atari bought the rights. The project then languished because of internal disruption at Atari. But if you are an educator looking for an inexpensive ($50 or so per Atari to connect it to the network), well engineered method of setting up a classroom full of Ataris, it would behoove you to write Atari and ask them to make this product widely available. (It is already installed in a few Bay Area schools.)

Art picks it up from here:

The Atari Bookshelf

Hundreds of books on computing have come out so far this year. Just as sales of Atari computers represent a small fraction of the computer market, the number of books pertaining to the Atari is equally small. Still the titles number in the dozens, so some recommendations in this column are long overdue.

There are two books that every Atari computer user *must* have. The first one has been around for almost two years. Still, its content and organization represent the best single reference for Atari information. *Your Atari Computer* by Lon Poole, Martin McNiff, and Steven Cook is published by Osborne/McGraw-Hill and affectionately called "The Purple Book." This $16 book covers the Atari computer system and Atari 8K Basic. The section on introductory and advanced graphics is one of the best I have seen anywhere.

Although the Purple Book does not discuss the XL computers, the information is still relevant. The appendices alone are probably worth the price of the book. They include material on memory usage, error messages, functions, PEEK and POKE locations, and conversion tables. Also, there are numerous programs and examples that reinforce the written information.

The other Atari related book that is a *must have* is a new one published by The Book Company. Written by Gary Phillips and Jerry White, the book is titled *The Atari User's Encyclopedia.* It is an up-to-date compilation of useful information for the Atari 400, 800 or XL computer owner. Everything from Basic to *Action* is discussed.

The format of the book is alphabetical entries by subject. Entries include descriptions of programming languages, one-paragraph summaries of software, and listings of publications and user groups. There is also a Basic tutorial at the beginning of the book complete with program listings and explanations. This 267-page, $20 book is a valuable resource.

Hayden has several titles on programming your Atari computer in Basic. Aimed at children 3 to 7 years old, *The Atari Playground* by Fred D'Ignazio contains 23 programs covering a broad range of subjects. Each of the programs has a story associated with it to reinforce the learning of word and number skills. The book explains how to participate in a spelling bee, draw with a computer crayon, watch ghosts appear and disappear, and play games against the Atari.

Fred has written another similar book called *Atari in Wonderland.* This book is meant for children ages 6 to 10. Here they learn how to write a book report, create songs, test reflexes, and count in French and Spanish among other things. Both of Fred's books cost $9.95 and include, in addition to the program listings, instructions for using the Atari graphic keys. Suggestions for program modifications are also given. There will soon be a cassette tape of the programs in both of these books.

Another new book from Hayden is *Basic Atari Basic* by Jim Coan and Richard Kushner. This $14.95 book is not simply another variation of Coan's Basic programming text which has been

The Atari Playground by Fred D'Ignazio contains 23 programs covering a broad range of subjects.

adapted to several computers. Rather, it has been extensively re-written to include Atari-specific information on such subjects as XL graphics modes 12 through 15, sound, and player-missile graphics.

An interesting new book is Jack Hardy's *Adventures with the Atari* published by Reston. No, this is not a book about getting software to run on the XL machines. Instead, it is a book about writing adventure games in three different programming languages: Pilot, Microsoft Basic, and Atari 8K Basic. Hardy gets you started designing and writing your own adventure games by including numerous examples of techniques and several complete games.

A systematic approach to adventure game writing is stressed, and the following subjects are covered: the game scenario, the objects, the map, the flowchart, keying the program, and play testing the game. Although this book is not for beginners, if you have an interest in adventure games you might want to check it out. $14.95 in paperback.

Atari Programming with 55 Programs by Linda Schreiber is another Basic programming book that has the advantage of giving you dozens of programs in addition to teaching you Basic. Although some of the programs are trivial and meant only for illustrating certain aspects of Basic programming on the Atari computer, there are *many* useful programs. Some are most useful as subroutines in your own programs. This is especially true for routines such as using the console keys, using the joysticks and paddles for input, and generating random numbers.

A description of each of the programs is given, including what specific Basic statements are used in the routines and how they accomplish the objective of the program. *Atari Programming* is published by Tab Books and sells for $14.50.

The last "learn how to program" book I will mention is called *Atari Player-Missile Graphics in Basic* by Philip Seyer. This $14.95 book is also published by Reston and is a good introduction to this sometimes difficult to understand topic. A step by step approach is used, and plenty of examples illustrate the various aspects of PMG.

A general book that I think is one of the best introductions to what computers are all about is called *Through the Micro Maze* written by Wayne Creekmore and published by Ashton-Tate. At first glance, $9.95 for a thin, 64-page, "glossy look" intro to computing may seem rather steep. But from the moment you begin to read page 1, you start to learn.

The text is brief but well written; the visuals are numerous and extremely easy to read; and each page is chock full of information. The material is far from being Atari-specific, but the basics of computing are well covered. The best way I can describe this book is to quote the author's brief dedication: "This book is dedicated to those of you who are curious about computers, want to buy one, are scared to death of them, don't understand the one you own, and don't like to read for hours." Excellent job, Wayne.

The last several books will not necessarily teach you *how* to program. They will not tell you secrets about making your programs run 30 percent faster. Nor will they give you a list of POKE locations in the appendix. What they will do is expand your mind if you read slowly and carefully digest the information you are reading.

One such book is *Genesis II* by Dale Peterson. The appropriate subtitle of the book is "Creation and Recreation with Computers." This thought-provoking book covers the gamut of computer-related topics from painting, music, and literature to games and the power of computers. The relationship between technology and the arts is explained by using many examples of how computers have added a new dimension to the

visual arts.

Other highlights of the book include a layperson's guide to computer graphics, a short history of computer games and their impact on society, and interviews with leading computer artists. *Genesis II* is well worth reading. Reston Publishing, $19.95.

Another thoughtful book that will have you reaching for your thinking cap is *The Art of Computer Games Design* by the one and only Chris Crawford, the premier game designer for Atari and until March of this year Atari's manager of research.

In this book, Crawford emphasizes the artistic dimension of computer games. In this way he reveals computer games design as a creative process rather than merely a technical one. He states that the central theme of the book is "that computer games constitute a new and poorly developed art form that holds great promise for both the game designer and the game player."

This book is must reading for anyone interested in game design or even those who just like to play computer games. Written well, it reads more like a novel than non-fiction. Osborne/McGraw-Hill, $14.95.

If you are really interested in why people play computer games, you may want to look at Geoffrey and Elizabeth Loftus's *Mind at Play: The Psychology of Video Games.* Both authors are cognitive psychologists, which occasionally makes the book a little bit technical. But the material is provocative nonetheless. Here is a sample, quoting the well-known psychologist Philip Zimbardo: "The video games that are proving so addictive to young people may not only be socially isolating but actually encourage violence between people." The authhors discuss this point and mention games such as *Frogger* and *Donkey Kong* as evidence that the current crop of video games is turning away from violence as the central theme. You may not agree with everything in the book, but you are sure to read logical arguments for what is being proposed. Basic Books, $14.95.

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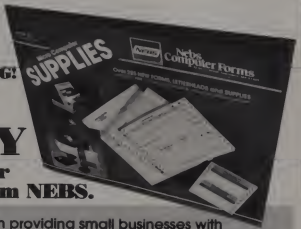

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Susan Glinert-Cole

The West Coast Computer Faire, once one of the most exciting and offbeat of the silicon set, was just another show this year. There were few new products introduced, and these were not particularly visionary. Two companies actually went to the trouble of designing *WordStar* Doppelgangers, spiritlessly duplicating the random key sequences of this venerable program.

If there was any focus at all to this show, I'd say it centered around the Macintosh, with a small smattering of improved mass storage devices for the PC. Several companies showed XT-type fixed disk drives. These are meant to be internal and do not require device drivers at boot time.

XComp is selling a super-floppy drive that will be able to store 2.5 Mb (formatted) on a single 5 ¼" preformatted disk. The drive itself is half height. XComp will also be selling a small auxiliary cabinet containing a fixed disk drive plus one super floppy for backup purposes.

Quadram introduced a sweet little color ink jet printer, smaller than the Epson, which uses snap-in cartridges. The printer is perfectly silent in operation and has a reasonable resolution for graphics at 640 dots per line. It will retail for about $895. Quadram also introduced a unique display card for the IBM PC. The Quadvue is a six-function monochrome card which supports word processing in up to four different fonts. According to the press release, the user will get an exact duplication of the on-screen fonts on the printer, but there is no mention of the printer(s) supported. Software is provided for custom font generation; this should make APL users, scientists, and Aramaic scholars very happy. The board also has a parallel port, one or two serial ports, and a clock calendar. The price is only $345.

The highlight of my particular West Coast experience had nothing to do with IBM products at all and, by rights, doesn't belong in this column, Ah well. I finally saw Niklaus Wirth's Modula 2 computer, appropriately named Lilith. For those of you unacquainted with this bit-slice machine, it was designed as a system developer's tool par excellence, running only Modula 2. Heretofore only available at great custom expense, the computer is now being manufactured commercially by Modula Computer Systems expressly for the system developers market. Housed in a beautifully finished walnut cabinet decorated with handcaned vent holes on the sides, it was attached to a Ball monitor. The resolution on this display makes the Lisa screen look like a furry TV picture by comparison. The software tools demonstrated included an editor capable of multiple fonts, windows and other esoterica, and a set of debugging tools that would bring tears to the eyes of any programmer. The software relies heavily on pull-down menus, invoked by a globular mouse. Considering the power of this machine, the prices, beginning at $7500 for a system unit and an IBM-type monitor, are unusually reasonable.

Heathkit is selling a do-it-yourself PC.

The game market has apparently dried up for the PC. I saw only one or two offerings, and these were mostly educational game/lesson products designed to seduce kids with the wiles of algebra and spelling. *Wizardry*, from SirTech, is a popular Apple game now available for the PC. It is a fantasy role-playing game, and, while I haven't personally played it, several people have recommended it to me as entertaining.

For those of you who enjoy diddling with solder, Heathkit is selling a do-it-yourself PC. For something around $1895, you get everything you need to build your own clone, which includes one disk drive (but no monitor). They will shortly be introducing a similar kit for a PC-compatible portable.

The West Coast Faire **nightlife** wasn't much this year either. **Ziff-Davis** had two parties, one of which featured **steak tartare** and **Adam Osborne**. **Microsoft** staged a luxurious do at the **Flood Mansion**, with a breathtaking view of the San Francisco harbor. Your correspondent was wedged between the **melon and prosciutto** and the pâte for several hours watching famous people reduce the hors d' oeuvres to **rubble**.

Snipes

Snipes, a clever and addictive game, was originally written as a diversion for Novell's networks, but is now offered for the stand-alone PC by SuperSet Software. The point of the game is to maneuver the hunter through a maze while searching out and destroying the portals through which the nasty snipes emerge.

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maze, and have a rather alarming degree of accuracy when they shoot at you. The longer you take to find the portals, the more snipes scuttle into the maze.

There are many levels to this game: you can set the maximum number of snipes allowed in the maze, the number of portals, and the degree of nastiness the snipes' weapons will have. At the higher levels, the walls of the maze become dangerous as well. The game will run on either a monochrome or a color display and is proof positive that network companies, devoted as they are to the serious business of office automation, can still maintain a sense of humor.

Active Trace

Through several momentary lapses in memory, I have acquired a couple of copies of a really neat utility from Awareco, called *Active Trace*. This set of programs is designed to untangle even the most convoluted Basic program by presenting the user with maps of variables, subroutine calls, and line number references. VREF is used to obtain a list of variable references by line number; GOREF does the same for GOTOs and GOSUBs. These programs require minimal input on the part of the programmer and will write the output to a disk file, the printer, or both.

While these two programs work well and are fairly fast, the star of the Awareco lineup is SCOPE. This utility lets you trace a program line by line, presenting you with the values of selected variables at each step of the way. A comprehensive set of menus lets you select such parameters as specific line numbers and variables to analyze, the specific interpreter you are working with, alternate reserve word lists, and particular command file to execute when SCOPE is invoked. This program, in conjunction with the VREF and GOREF, makes a powerful set of debugging tools for the Basic programmer. The programs are not copy-protected.

The people at Awareco seem to put a premium on holding the user's hand. The documentation is almost worth the price of the package. While not particularly elegant in looks, it is a marvelous exposition on programming philosophy and has some very unexpected and funny remarks scattered within. The program set sells for $79.95 and includes a newsletter with a picture of the Gosub Guru swallowing a seven foot length of spaghetti code.

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CBasic and the GSX Module

Digital Research threw in the towel with regard to the place of CP/M in the 16-bit world and now offers their very

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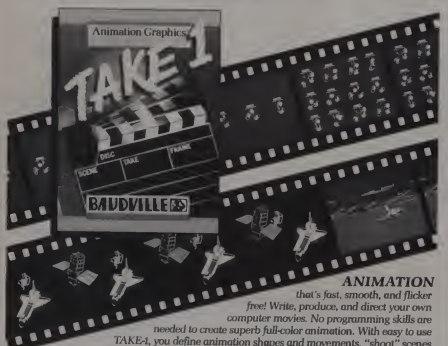

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popular compilers under PC-DOS. I have had the opportunity to look at two of them briefly: Pascal MT+ and CBasic with the graphics extension (GSX-86). Both languages have features unavailable in the comparable Microsoft versions. MT+ for example, supports overlays, allows in-line assembly code, and lets you painlessly perform DOS function calls from within a program.

The CBasic compiler has some handy bells and whistles like COMMAND$, which returns a command string used when the program was invoked. MATCH returns the position of the first occurence of a particular character pattern in a string. SADD returns the address of a specified string. UCASE$ will convert lowercase characters to uppercase.

There are also several statements and functions in CBasic designed for use in multi-user/tasking environments. For example, ATTACH returns a Boolean value indicating whether or not a specified printer is available for program use. If the printer is available, ATTACH attaches it to the program, thus allowing it to be accessed. DETACH does the opposite, making the printer unavailable to the applications program. The functions LOCK and its opposite number, UNLOCK, are used for coordinating record access in a multi-user situation. LOCK prevents a program from modifying a record; UNLOCK releases the record for write access.

CBasic does not support any music functions in the present version (2.1), nor is there the elaborate range of "ON (device) GOSUB" available in MS-Basic.

The documentation is uneven; in some places it is lucid, while in others it tends to wander and confuse by omission. There are several reserved words for which no explanation is given. Both the MT+ and the CBasic compilers have a very difficult time with the end of a source code file. MT+ absolutely requires a carriage return after the final END statement. If this is omitted, the compiler freezes the system, requiring a hard reset. The CB compiler was very unhappy about the way my text editor ends a file (it does not insert any control characters). The compiler found 47 errors of the "invalid character in source file" when it failed to locate a Ctrl-Z after the final END statement. It was, however, indifferent to the presence or absence of a carriage return. Microsoft's compilers are uniformly happy with the files produced by my editor, and the inconsistent requirements of Digital's compilers are irritating.

The original CBasic-86, which runs under CP/M-86, did not have any graphics support for the IBM-PC. Happily, the folks at Digital Research rem-

edied this omission when they reissued the PC-DOS version. The graphics extension to CBasic is fairly complete and sophisticated on the face of it, but several features described in the manual are not really all there. It comes with quite a few printer and video drivers supporting the Hercules monochrome and the IBM color graphics board, the Microsoft and Mouse Systems mice and 16 printers and plotters.

GSX-86 is designed to be device independent, that is, all graphic output devices like displays, plotters, and printers, appear the same to the applications program. If you decide, for example, to output to a plotter instead of the console, no changes are required in the program code. Getting the proper drivers installed can be a little tricky. The manual has been superseded in places by several lengthy READ.ME files on the GSX-86 disk, and if you are so foolish as to try the installation without having thoroughly read them, you will have numerous unpleasant surprises in store.

There are about 25 statements in the graphics module that augment the CBasic language. Some of them have a counterpart in Microsoft Basic: CLEAR/CLS and MAT FILL/PAINT, for example. There are, alas, no statements in the GSX-86 module comparable to PSET, nor does there appear to be a way to set the background color of the display.

The remainder of the CBasic statements are unique and are more oriented towards business graphics than scribble and draw programs. Several statements are useful for making classy graphs. CHARACTER HEIGHT defines the height of letters relative to the length of the Y coordinate. TEXT ANGLE sets the tilt at which the text will print relative to the horizontal. LINE STYLE lets you set the type of line for any subsequent PLOT or MAT PLOT statement. Four standard styles are given: solid, dashed, dotted, and dashed-dotted. ASK STYLE COUNT returns the line styles available on the current open device. Marker types, of which there are at least five, can be selected with SET MARKER TYPE. Market height, relative to the current extent of the Y coordinate, can also be specified with SET MARKER HEIGHT. An entire array of X and Y coordinates can be plotted with markers with one MAT MARKER statement; this is obviously very useful for drawing point graphs in a speedy manner.

The range of the coordinate system is established using a SET WINDOW followed by the X and Y bounds of the corners. This statement can be used to alter the aspect ratio of a device as well. The actual window boundaries can be changed with SET VIEWPORT followed

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-----------------------------------------------------

end of pass 1
end of pass 2
    1:  0000h REM     This program demonstrates some of the features of CBASIC-86's
    2:  0000h REM                       GSX-86 Graphics Extension Module
    3:  0000h REM                       Susan Gliner-Cole  4/2/84
    4:  0000h REM
    5:  0000h         %INCLUDE GRAPHCOM.BAS
    6=a 0000h COMMON %VIEW(2),%WIND(2),?P(2),?P1(2),%XPIX(2)
    7=a 0000h COMMON ?PTSIZ(1),?PTSIZ(1),?CONTZ(1),?INTIZ(1),?INTOZ(1)
    8=a 0000h COMMON %ATX(2),?RVIN(2),%X(1),?XN,?YN,?XH,?YH
    9:  0000h         GRAPHIC OPEN 1                                  REM   open the display
   10:  0013h         CLEAR                                           REM   clear the screen
   11:  0016h
   12:  0016h         SET WINDOW 0,100,0,100                          REM   make window 100x100
   13:  0034h         SET CHARACTER HEIGHT 40                         REM   set title height
   14:  0040h         GRAPHIC PRINT AT (33,90): "XXX TILT XXX"REM   print the title
   15:  0056h
   16:  0056h         SET CHARACTER HEIGHT 0                          REM   set height for show
   17:  0062h
   18:  0062h         PI = 3.1415926                                  REM   figure radians in
   19:  006Bh         RADIANS = PI%2                                  REM   degrees
   20:  007Dh         DEGREES = RADIANS/360
   21:  008Fh
   22:  008Fh         FOR TILT = 0 TO 360 STEP 90
   23:  009Dh            SET TEXT ANGLE  TILT%DEGREES
   24:  00ACh            GRAPHIC PRINT AT (25,55): " FOOBAR (((((((((("
   25:  00C2h            GRAPHIC PRINT AT (75,45): " FOOBAR ))))))))))"
   26:  00D8h            GRAPHIC PRINT AT (30,70): "XXXXXXXXXXXXXXXX"
   27:  00EEh            GRAPHIC PRINT AT (70,30): "XXXXXXXXXXXXXXXX"
   28:  0104h         NEXT TILT
   29:  013Ch
   30:  013Ch X:      GOTO X
   31:  013Eh
   32:  013Eh         SET TEXT ANGLE 0
   33:  0144h         GRAPHIC CLOSE
   34:  0153h         END
end of compilation
no errors detected
code area size:    339       0153h
data area size:    184       00b8h
common area size:  58        003ah
symbol table space remaining: 40918
```

by the corners of the desired window.

The GSX-86 module comes with the source code for several demonstration programs, and numerous other examples are given in the manual. The demos are not very spiffy, especially compared to some of the ones supplied with the PC-DOS disk, but they give a good feeling for what this graphics extension is capable of doing.

Now for the bad news. Listing 1 is a small program I wrote to demonstrate some of the GSX-86 commands. I discovered several more unpleasant surprises when the program was run. First of all, none of the HEIGHT statements is implemented at the present time. This little fact was found in one of the READ.ME files after noticing that SET CHARACTER HEIGHT had no effect on the size of the letters. SET MARKER HEIGHT is in the same boat.

Second, while the screen looked OK, the rendition of this program on my printer is terrible. Figure 2 shows what Digital Research thinks is a decent printout; Figure 3 is an accurate screen dump of the display done with the *Prowriter Utilities* from Courtrin Enterprises (these excellent programs will be described at a later time). In effect, the device drivers are a little suspect.

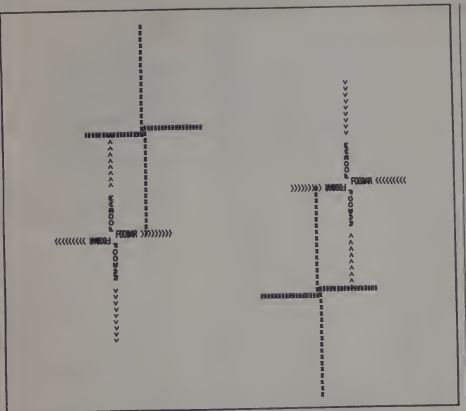


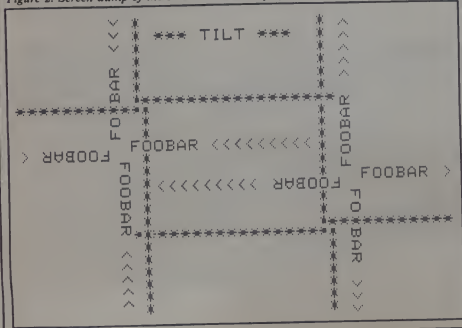
Figure 1. Printout from FOOBAR.BAS using the GSX-86 device driver.

Third, if you are so unwise as to turn off the printer while it is printing, the program makes a very ungraceful exit. This is somewhat better than the fourth complaint: you cannot break out of the program at all without resetting the computer. The GOTO X line, while allowing the picture to remain on the screen as long as I wanted to see tilted lines of FOOBARs, also forced me to reset the computer when I got bored with the display.

Speaking of Reset . . .

For reasons too lengthy to go into here, I received a new Combo card from Apparat. Along with the plebeian clock/calendar, serial, parallel, and game ports, there is a little gizmo called a reset switch. This last fits neatly into the knockout plug at the rear of the PC and performs a function many programmers will find irreplaceable. I call it a squishy reset, because it is midway between a soft reset, done with the CTRL-ALT-DEL key combination and the hard reset performed by turning the computer off, waiting, turning the computer on, waiting, waiting, waiting . . . Every time the soft reset fails to bring life back to my display, pressing the squishy reset switch manages to do it without requiring a power-down. If you are a programmer who spends a lot of time flicking the PC ON/OFF switch, I recommend this little addition to your system. ■

Figure 2. Screen dump of the FOOBAR.BAS display.



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Box 695
Gualala, CA 95445
(707) 884-4019

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Pacific Grove, CA 93950
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Denver, CO 80237
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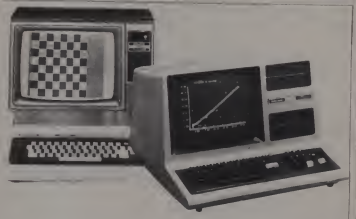
A Printer and other new products for Radio Shack Computers



TRS-80 Strings

Stephen B. Gray

As the speedometer of our Tandy Special reaches the 65 mark, we see on the superhighway ahead of us the TRS-80 video cassettes, SCM's Ultrasonic Messenger III electronic typewriter/printer, the Add-A-Voice program from H.I.B, and another short program that creates twinkling stars.

TRS-80 Video Cassettes

At your local Radio Shack Computer Center or Computer Department, you may have noticed, over in a corner near a TV set, a VHS video cassette player and a dozen video cassettes. Perhaps you've even looked at the titles: *Scripsit* Seminar, Accounting Software Seminar, *VisiCalc* Software Seminar, A Day in the Life of the Model 100, *Agristar, Profile Plus,* Legal Software Seminar, *Multiplan,* etc. Each is 10 to 20 minutes long.

These aren't tutorials; they're commercials covering the basic features of the products. These sales tools are played at the Radio Shack seminars offered on various software packages to help encourage the attendees to buy the product. They're also used occasionally by Computer Center personnel to familiarize themselves with various products (for such people there are also special tapes on selling techniques).

The tapes are professionally made and resemble top-flight extended TV commercials. They all have the same beginning: a long introduction that discusses Radio Shack, "the largest chain of retail stores in the world," the Computer Center concept, the TRS-80, etc. Then the tape examines the main features of the software package.

The tapes usually blend mini-dramas with show-and-tell. "The *Scripsit* Difference" tape, for example, shows a harassed secretary whose boss wants a complicated report revised (and re-revised) by noon. We see brief segments of this continuing saga between descriptions of *Scripsit* features, showing (with close-ups) how they look on the screen; what kind of documents can be created with *Scripsit;* how to prepare a document, make corrections, move or delete phrases or sentences; do a global search and replace; use spelling checkers, hyphenation and page numbering; handle printing formats; use *Scripsit* with accounting and other packages; etc.

Several *Scripsit* users give testimonials. Several TRS-80 models are described, including the II, 16, 4, and 12, and also *Superscripsit.* Some prices are given.

The tape ends with the boss promising his secretary that if she retypes the report just one more time, he'll look into Radio Shack's TRS-80 and *Scripsit.*

These tapes are in every Radio Shack Computer Center and in some Computer Departments. They are excellent sales tools, designed to show the basics of how the product works, its advantages, what it runs on, and how much it costs. If you attend a software seminar, you may have a chance to see one of these fine commercials.

SCM Ultrasonic III Typewriter/Printer

The print mechanism used in the Smith-Corona L-1000 daisywheel

Figure 1. The SCM Ultrasonic Messenger III portable typewriter can also be used as a computer printer: ten printwheels are available in three pitches.

printer, reviewed here in the previous issue, is also used in several SCM electronic typewriters.

The SCM Ultrasonic 111 Messenger (Figure 1) is a portable (22-pound) model that doubles as a computer printer and offers electronic features such as full-line memory correction, triple pitch selection (10, 12, 15 cpi), and automatic underlining and centering. Combined with its optional Messenger Module, the typewriter becomes a letter quality daisywheel computer printer. The typewriter has a suggested list price of $635 (it is available in New York for under $440); the Messenger Module is $170 (available for less than $150).

Typewriter

To use the SCM Ultrasonic 111 as a typewriter, just slide the pitch selector to the setting appropriate for the printwheel used, insert paper, and start typing.

The three pitches are pica (10 characters per inch), elite (12 cpi), and micro (15 cpi). A different look can be achieved by using a 12-pitch printwheel at 10 pitch ("to provide an exceptionally attractive open styling," as a brochure puts it) or a 15-pitch printwheel in 10- or 12-pitch settings.

All L-1000 printwheels fit the typewriter, and vice versa, since the print mechanism is the same in both, with one difference: the typewriter has an error-correction tape.

Several printwheels are available for each pitch; at least two are designed to be used at either 10 or 12 cpi. The one for computer use is the ASCII Tempo 10/12 wheel, which includes characters not found on the other wheels (Figure 2).

Tempo 10 is a 10-cpi non-ASCII printwheel with characters a little different from the ASCII Tempo 10/12. Regency 10 is a modern version of standard pica.

Printwheels are easily changed. Just remove the ribbon cassette, move the print hammer back from the printwheel, pull the printwheel off its spindle, and reverse the process with another printwheel. All this can be easily done in less than 15 seconds.

```
The ASCII TEMPO 10/12
at 10 cpi: < > ^ \ |
and many other signs.
Same: 12 letters an inch.
Again: 15 letters to the inch.
Tempo 10 is the non-
ASCII 10-pitch wheel.
Regency 10 is a mod-
ern pica style.
```

Figure 2. These are only three of the ten typefaces available for the SCM Ultrasonic Messenger typewriter.

Ribbons

All three of the ribbons designed for the L-1000 printer can be used on the Ultrasonic 111 typewriter: reusable fabric (nylon) ribbon and one-time multistrike and single-strike mylar film ribbons.

In addition, the SCM electronic typewriters use Lift-Rite film ribbons, which have a different chemical formulation than the mylar printer ribbons. Lift-Rite prints characters that can be lifted right off the paper with Lift-Rite correction tape.

The Ultrasonic 111 has a memory that holds a full line of characters and will automatically correct any or all of them. To backspace and erase (lift off) characters simultaneously, just press the CORRECT key all the way down, and hold it until all the wrong ones have been deleted. Then type in the correct characters.

Preset Mode

When the typewriter is first turned on, a PRESET light turns on at the top left of the keyboard. This indicates that the margins and tabs are pre-defined, at settings that depend on which pitch has been selected.

For example, at 10 pitch the left margin is at 12, the first tab at 17 (standard paragraph indent), second tab at 42 (center of the writing line), third tab at 52 (signature position), and right margin at 72. At 15 pitch those settings are 18, 25, 63, 78, and 108.

All these settings are easily changed using the LEFT MARGIN, RIGHT MARGIN, TAB CLEAR, TAB SET, and MARGIN RELEASE keys. Change any setting, and the PROGRAMMED light turns on instead of the PRESET light, to let you know which mode you are in.

As an electronic typewriter, the SCM Ultrasonic Messenger is fine; I've been using it for several months and like it very much. However, I'd like to see several changes in a future model:

- When you turn the power off, the typewriter returns to the preset margins and tabs. If TV sets can remember the previous station setting while turned off, why couldn't an electronic typewriter? That way, you wouldn't have to keep reprogramming margins and tabs to often-used settings every time the machine is turned on.
- The margin release seems to be mechanical; that is, it doesn't release unless you press the key when the

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– Dickie Mitchell, Age 9

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printhead is exactly at the end of the line. I'd like the key to release the margin no matter where the printhead is, so when you're typing and get the end-of-line beep (five spaces before the end of the line), you can hit the MARGIN RELEASE key and keep on going. As it is, you have to wait until you're at the end of the line for the key to be effective.

Enhanced Typewriter Features

Most electronic typewriters offer features not found on standard electric models. The Ultrasonic has a nice variety of such enhancements, activated by pressing the CODE key and a number key from 1 to 0.

Auto Return returns the carrier to the left margin at the end of each typed line.

Auto Center centers text between the margins currently in use.

Auto Underscore underlines words but not the spaces between, on Code 5; all word and spaces are underlined on Code 6.

Tab Center centers typed text over a particular tab stop.

Decimal Tab allows you to do statistical typing; all numbers are aligned on their decimal points.

Flush Right aligns text evenly to the left of a particular tab stop.

Printer

If you have an SCM Ultrasonic typewriter, it can be upgraded to be used as a printer like the Messenger model. Either way, you need the Messenger Module between your computer and the typewriter. Although the L-1000 prints in both directions, the typewriter is unidirectional.

The SCM Messenger Module (Figure 3) measures 1.8 x 6 x 8.8 inches and weighs 2.5 pounds. It has both RS-232C serial and Centronics-compatible parallel interfaces; the serial interface has both hardware and software handshake protocols. You'll need an interface cable; I use the parallel 26-1401 cable with the Model I/III/4.

Press the CODE key and letter P, and the typewriter goes into printer mode. The left and right margins are set to their extreme positions, and all tabs are cleared; margins and tabs are now under computer control, as is pitch.

Controls that were operated from the keyboard in typewriter mode are set from Basic CHR$ statements in printer mode using the same software codes as the L-1000 printer. For example, setting pitch via software requires three CHR$ codes: CHR$(27) for ESC, CHR$(31) for setting pitch, and CHR$(12 or 10 or 8) for pitches 10, 12 or 15 cpi, respectively.

By using CODE-P again while in printer mode, you can get back into typewriter mode whenever you need to insert text manually, such as a name and address on a form letter.

Figure 3. The SCM Messenger Module contains serial and parallel interfaces, and DIP switches for controlling various features.

Inside the Messenger Module are the same 14 DIP switches as in the L-1000 printer, to control features such as character length, parity, baud rate, and whether or not a carriage return is to be accompanied by an automatic linefeed. For the TRS-80, all you need do is turn on that last one, or else the paper will never space up.

By the way, the "Ultrasonic" in the name isn't just there because it sounds futuristic. The typewriter actually operates by sending high-pitched sounds from the keyboard to the print mechanism, thus eliminating all mechanical and electronic linkages between the two. This simplifies design and manufacture.

Ultrasonic III Lookalikes

The SCM Ultrasonic III Messenger typewriter was designed to be sold by office equipment and typewriter dealers. Two similar typewriters, with almost the same features and slightly varying prices, are also offered, tailored to specific markets. The Citation III is designed for department stores and the Memory Correct III for mass merchandisers and catalog houses. Both are available in Messenger models; add the optional Messenger Module to either and you have a computer printer.

As an example, the Citation III Messenger is $24 less (in suggested retail price) than the Ultrasonic III Messenger; it lacks automatic underlining and several tab features (Tab Center, Decimal Tab, Flush Right) found in the latter.

Changes I'd Like to See

There are several printer-type things I'd like to see changed for the Ultrasonic IV, or whatever the next model will be called:

- Put rollers on the paper bail, as on

"I made homework fun using a joystick and FLYING COLORS.™"
– Katherine Mitchell, Age 11

You're looking at the title page for "The Littlest Pumpkin", an original story with pictures that Katherine did for school.

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the L-1000; without them, in printer mode, the paper can get all messed up.

• Include information regarding which line at the top of a page the printing will start on. As it is, much paper can be wasted figuring this out.

Even without these changes, the SCM Ultrasonic III Messenger is an excellent typewriter and a fine printer; both provide printing you'll be proud of.

Add-A-Voice

Add-A-Voice is a machine language utility from H.I.B. that lets you add voice output to any Basic program for a TRS-80 Color Computer with 16K or more of memory (Extended Basic is not required).

Human speech was used to create 25 words, which were digitally recorded and then written on tape, for reading into memory. This lets you create voice

Only two simple commands are needed to select and generate a spoken word from your TV speaker.

output at any time in the program, using any combination of the stored words. Only two simple commands are needed to select and generate a spoken word from your TV speaker.

Two sets of words are provided to be used one set at a time. The Game Set has 13 words: win, lose, I, you, go, hit, got, me, stop, help, missed, oh, heh (laugh). The Quiz Set has 12 words: you, yes, no, good, sorry, are, right, wrong, try, again, a, winner.

The entire *Add-A-Voice* program, including one of the word sets and the driver program, uses 4K of memory.

Generating Voice Output

To generate a voice output, use these two Basic statements in your program:

```
POKE 15694, X
G=USR(1)
```

where X is a decimal between 0 and 12 that indicates the word to be generated. WIN is word 0 in the Game Set; WINNER is word 11 in the Quiz Set.

To change the pitch of the voice, use

```
POKE 15987,X
```

where X is a decimal number between 1 and 20 with 11 being the normal pitch.

The typed five-page manual (two pages are program listings) says you can add a filter to the program, "to smooth the voice." The sound is just about the same with or without a filter, resembling a voice transmitted from a million miles in space, surrounded by white noise. However, it is recognizable, especially after you become familiar with the short list of words.

Add-A-Voice Demos

Two demonstration programs are provided, one for each word set. The Quiz Set demo asks you to add numbers, such as:

```
  6 + 3 =
```

and if you answer 9, you'll hear

```
  GOOD, RIGHT AGAIN
```

or

```
  YOU ARE A WINNER
```

or

```
  YES, YOU ARE RIGHT
```

or

```
  YES, YES, YES.
```

Enter a wrong answer, and you'll hear

```
  NO, YOU ARE WRONG
```

or

```
  SORRY, TRY AGAIN.
```

The stored words include enough blank space after each so that when several are used in a phrase, they don't run together.

Run the Game Set demo, and first you'll be asked to specify a voice pitch (6 is high, 15 is low), and to turn the filter on or off. Then enter a number between 1 and 5, and a voice says a few words at the same time the words are shown on the screen, to demonstrate phrases that might be used in games, such as:

```
  YOU WIN—I LOSE
```

or

```
  OH! OH! STOP! HELP!
```

or

```
  I MISSED YOU
```

or

```
  I GOT YOU, HEH-HEH
```

or

```
  YOU HIT ME.
```

That's all there is to it, except for two "Tips to conserve memory in your Basic program," the second of which is: Use a DATA statement to specify the number of each word in a phrase, like this: DATA 1,5,7,4,9. Then READ these numbers and POKE them into memory to generate a voice output.

Complete listings of the two demo programs are provided to show how simple it is to add voice to a Basic program.

Add-A-Voice is $14.95, plus $1 for shipping and handling, from H.I.B. Specify 16K or 32K.

Short Program 49: Twinkle 2

The November 1983 column ended with a short program (p. 330) that creates the effect of twinkling stars. But not quite, so readers were asked if they could improve on the original program. Many sent in responses; the better ones will be reprinted here. One at a time, that is, so as not to bore you with all that twinkling.

Fred Burggraf of Port Tobacco, MD, has a straightforward approach:

```
100 RANDOM
110 DIM A(100), B(100)
120 CLS
130 FOR Z=1 TO 100
140 A(Z) = RND(127)
150 B(Z) = RND(47)
160 SET(A(Z),B(Z))
170 NEXT
180 Z=RND(98)+1
190 RESET(A(Z),B(Z))
200 RESET(A(Z+1),B(Z+1))
210 RESET(A(Z-1),B(Z-1))
220 FOR ZZ=1 TO 20: NEXT
230 SET(A(Z),B(Z))
240 SET(A(Z+1),B(Z+1))
250 SET(A(Z-1),B(Z-1))
260 GOTO 180
```

This clever adaptation and expansion of the original uses twin arrays (110) to turn on 100 pixels (stars)(130-170) in random locations across the sky (screen). Then it randomly resets a star (190) along with two others: the stars to the immediate southeast (200) and northwest (210); that is, if there are stars in those three locations. After a slight delay (220) to provide a more realistic twinkle than a fast off-and-on, these three stars (actually, from zero to three stars) are turned on again (230-250). Line 260 recycles the program, to continue the twinkle process among the 100 stars in this fixed TRS-80 firmament.

Because not many stars in this display are accompanied by immediate SE/NW companions, almost the same effect can be achieved without lines 200-210 and 240-250. However, the delay in line 220 should then be increased to 40 from 20 to make up for the delay provided by the eliminated lines.

For more twinkle programs, stay tuned to this station. ■

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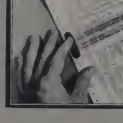

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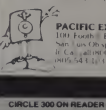

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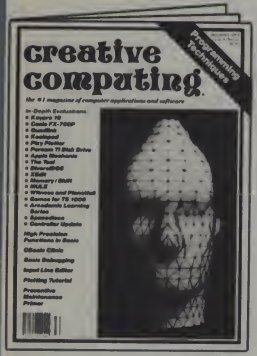

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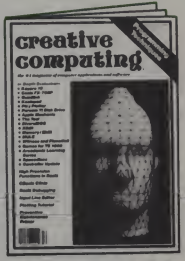

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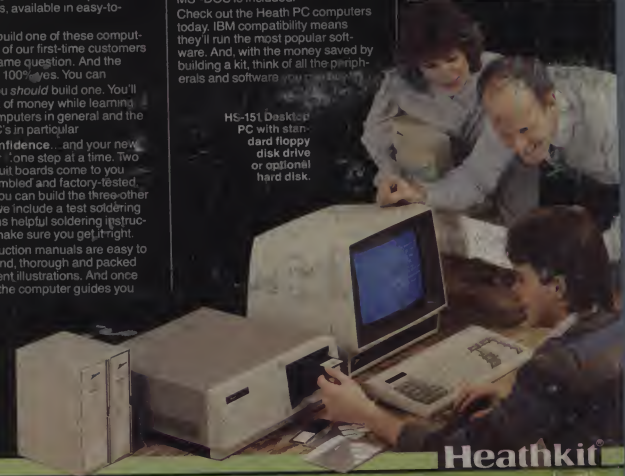

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